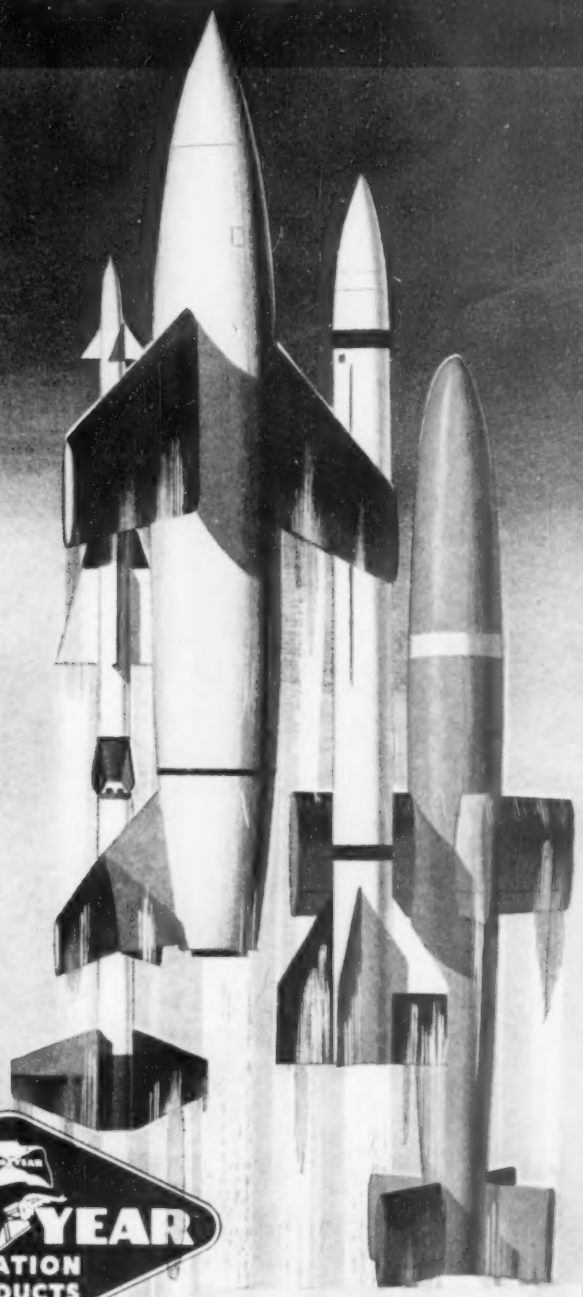
AVIATION WEEK

OCT. 11, 1954

.50 CENTS

A McGRAW-HILL PUBLICATION

what makes a missile GO?



IN this age of guided missiles and pilotless bombers, the range of the weapons is often determined by the punch that can be packed into a limited amount of fuel.

Time and again, Goodyear Aviation Products Division has been called upon to cope with special problems posed by the new and difficult fuels being utilized for missile propulsion.

Our fuel cell experience and facilities have pioneered new ways of handling and stowing a variety of these fantastic fuels—and today we are busy on many more.

Working closely with our customers, we have licked searching problems concerning monopropellant and fuel- and oxidizer-systems—produced containers, diaphragms and expeller bags which withstand corrosion and extreme temperatures—found ways to safeguard many of these fantastic fuels from catalytic decomposition which otherwise could result in ruinous detonation.

Come to us with your fuel container problems. You'll find willingness, desire, and facilities to work on your new developments—even on a limited scale. *You'll gain from the unrivaled experience offered by Goodyear in taming and actuating "flighty" fuels!*

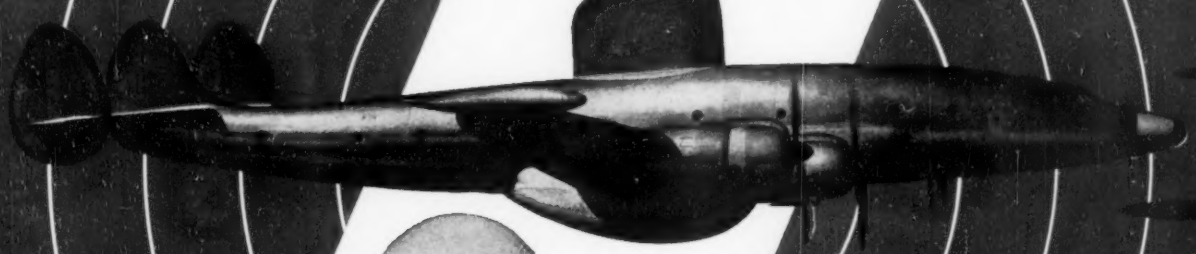
Goodyear, Aviation Products Division,
Akron 16, Ohio or Los Angeles 54, Calif.

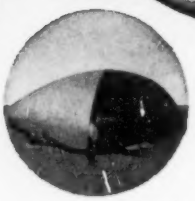
GOODYEAR AVIATION PRODUCTS

FACILITIES + ABILITIES = EXTRA *plus* IN

E B POWER GS
UNIVERSITY MICROFILM INT
313 N 1ST ST
ANN ARBOR MICH

ZENITH skill produces world's largest radomes for Lockheed "Sentinels of the Air"





The huge radomes above and below the Lockheed Super-Constellation, and the novel anti-icing radome in the nose, are products of Zenith's specialized technique and skill in reinforced plastics combined with electronics. These are the giant radomes which provide 360-degree "eyes and ears" for the U. S. Navy and Air Force, scouting far beyond the borders of the United States for early warning of enemy attack.

Zenith's unique background of experience in this highly specialized field is available on contact with Engineering Department—

ZENITH AIRCRAFT a Zenith Plastics Co. product, Gardena, Calif.

Believe me . . . the only one who gets by him is the man from Fafnir!

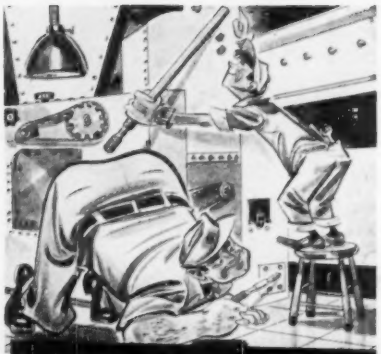
Fafnir Y-PWI Series Bearings for Cyclic Pitch Control

Knowing how to get around tough aircraft bearing design problems has been a specialty of Fafnir Bearing Engineers for more than a quarter century. Direct result of this knack is the Fafnir Y-PWI Series Thin Section Mated Bearings. Specially designed for wartime "whirly-birds", the Y-PWI Series is just one of many types of Fafnir aircraft and radial bearings now being used by the helicopter industry. The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR

AIRCRAFT BEARINGS

FIRST . . . at the turning points in aircraft design



Midgets or Giants?

You'll find both in PROTO's EXPANDED Line of Torquers

Recent additions of PROTO Torquers make it possible for you to now have this amazing tool in drive sizes from ¼" "midgets" to ¾" "giants" and with capacities ranging from 5 to 4800 inch-pounds! Major aircraft companies have found this torque-*limiting* wrench to be faster and sturdier than other types used. These features, plus *automatic* release, micrometer-type adjustment, trouble-free construction, and elimination of pointers and dials, have resulted in extensive approval of the Torquer by the aircraft industry. Ask for an on-the-job demonstration, and buy the models you need—plain or ratchet head—from your PROTO dealer. Send 10¢ for 68-page catalog of entire line to

PLOMB TOOL COMPANY
2221A Santa Fe Ave.,
Los Angeles 54, Calif.

Head Only of Ratchet Models

No. 6071 No. 6063

FLASH!

PROTO Torquers are supplied to the U.S. Air Force under Military Specification MIL-H-4034A (USAF)

PROTO TOOLS
PROTO means PROfessional TOols

Eastern Factory—Jamestown, N.Y. 5496
Canadian Factory—London, Ont.

Aviation Week

OCTOBER 11, 1954 VOL. 61, NO. 15

Editorial Offices
New York 36—330 W. 42nd St., Phone LOngacre 4-3000 (Night LO 4-3035)
Washington 4, D. C.—National Press Bldg., Phone NAtional 8-3414
Los Angeles 17—1111 Wilshire Blvd., Phone MAdison 6-4323
Table of Contents on Page 8 53,309 copies of this issue printed

Robert W. Martin, Jr. ..... *Publisher*
Robert H. Wood ..... *Editor*

Robert B. Hotz, *Executive Editor*

Albert W. Bentz ..... **News Editor**
David A. Anderton ..... **Engineering**
Irving Stone ..... **Technical**
G. L. Christian ..... **Equipment, Maintenance**
Katherine Johnsen ..... **Congress**
Philip Klass ..... **Avionics**
Claude O. Witze ..... **Military**
Frank Shea, Jr. ..... **Transport**
Craig Lewis ..... **Transport**
Erwin J. Bulban ..... **Special Assignments**
William J. Coughlin ..... **West Coast**
Bernie Lang ..... **West Coast Assistant**
Henry Lefer ..... **News Desk**
Gordon C. Conley ..... **News Desk**
G. J. McAllister ..... **Washington News Desk**
Lawrence J. Herb ..... **Art Editor**
Victoria Giaculli ..... **Editorial Makeup**
Leo T. Tarpey ..... **Printing & Production**

DOMESTIC NEWS BUREAUS

Atlanta 3 ..... 801 Rhodes-Haverty Bldg.
Chicago 11 ..... 520 No. Michigan Ave.
Cleveland 15 ..... 1510 Hanna Bldg.
Detroit 26 ..... 856 Penobscot Bldg.
Houston 25 ..... 1303 Prudential Bldg.
Los Angeles ..... 1111 Wilshire Blvd.
San Francisco ..... 68 Post St.
Washington 4 ..... 1189 National Press Bldg.

FOREIGN NEWS SERVICE

Editor ..... Joseph K. Van Denburg, Jr.
London ..... Edward W. S. Hull
Paris ..... John O. Coppock
Bonn ..... Gerald W. Schroder
Manila ..... Herbert Leopold
Mexico City ..... John Wilhelm
Sao Paulo ..... Lionel J. Helmes
Tokyo ..... Dan Kurzman

Aviation Week is served by PRESS ASSOCIATION, INC., a subsidiary of Associated Press.

Research and Marketing: Irina Nelidow, Mary Whitney Fenton and Jeanne Rabstejnek.

J. G. Johnson ..... *Business Manager*

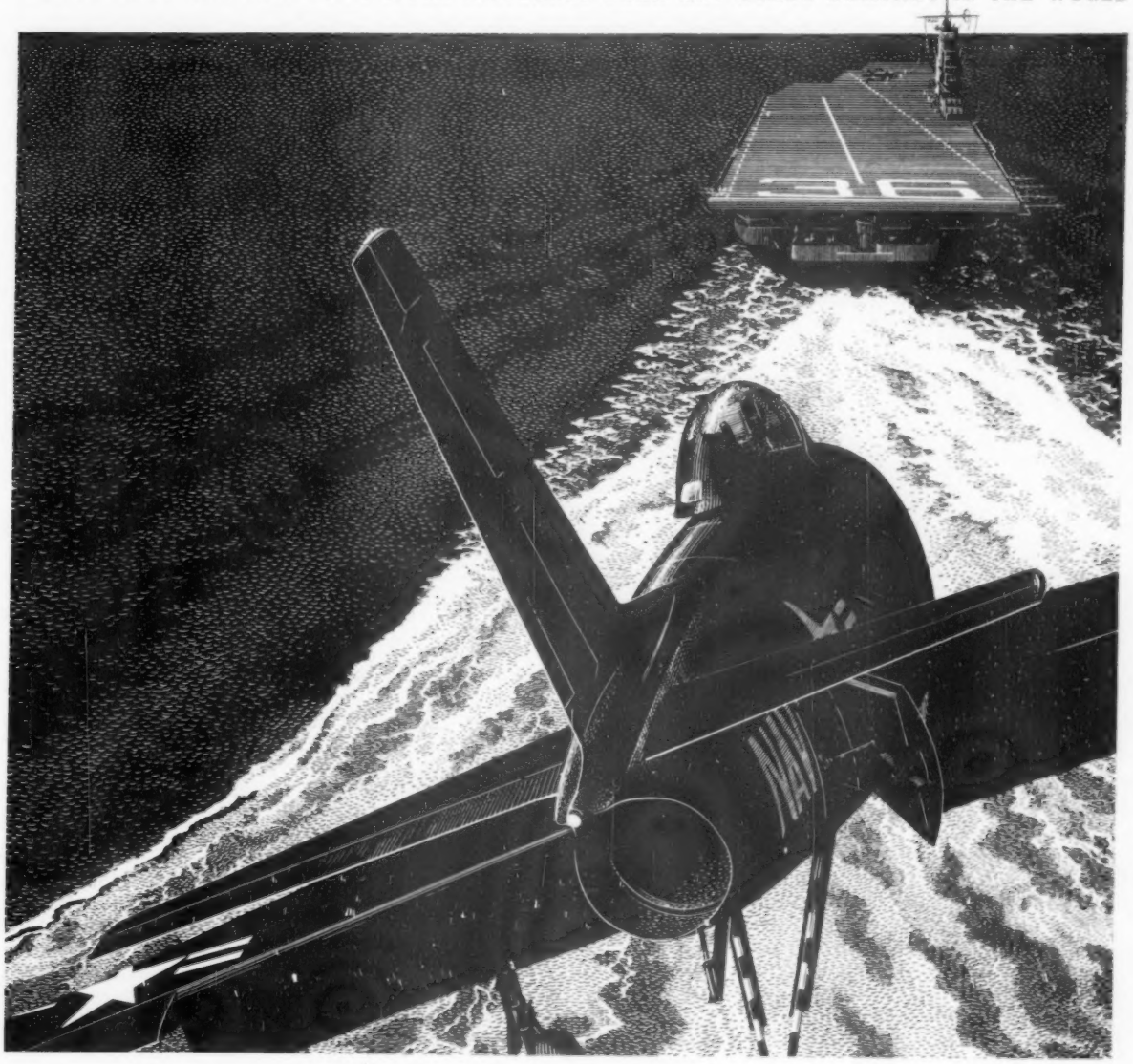
T. B. Olsen, **Promotion Manager** W. V. Cockren, **Production Manager**

Sales Representatives: J. C. Anthony, **New York**; H. P. Johnson, **Cleveland**; D. T. Brennan and J. S. Costello, **Chicago** and **St. Louis**; E. P. Blanchard, Jr., **Boston**; James Cash, **Dallas**; William D. Lanier, Jr., **Atlanta**; R. E. Dorland, **San Francisco**; C. F. McReynolds and Gordon Jones, **Los Angeles**; W. S. Hessey, **Philadelphia**; C. A. Ransdell, **Detroit**. Other sales offices in **Pittsburgh, London.**

AVIATION WEEK • OCTOBER 11, 1954 Vol. 61, No. 15
Member ABP and ABC

Published weekly by McGraw-Hill Publishing Company, James H. McGraw (1860-1948), Founder. **Publication Office: 99-129 North Broadway, Albany 1, N. Y.**
Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y. Donald C. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Executive Vice-President, Publications Division; Ralph B. Smith, Vice-President and Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.
Subscriptions: Address correspondence to AVIATION WEEK—Subscription Service, 99-129 North Broadway, Albany 1, N. Y. or 330 W. 42nd St., New York 36, N. Y. Allow 10 days for change of address.
Subscriptions are solicited only from persons who have a commercial or professional interest in aviation. Position and company connection must be indicated on subscription orders.
Single copies 50¢. Subscription rates—United States and possessions, $6 a year; $9 for two years; $12 for three years. Canada $8 a year; $12 for two years; $16 for three years, payable in Canadian currency at par. Other Western Hemisphere and the Philippines $10 a year; $16 for two years; $20 for three years. All other countries, $20 a year; $30 for two years; $40 for three years. Entered as second-class matter July 16, 1947, at the Post Office at Albany, N. Y., under Act of Mar. 3, 1879. Printed in U. S. A. Copyright 1954 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved. Cable Address: "McGraw-Hill New York." Publications combined with AVIATION WEEK are AVIATION, AVIATION NEWS, AIR TRANSPORT, AERONAUTICAL ENGINEERING and AIRCRAFT JOURNAL. All rights to these names are reserved by McGraw-Hill Publishing Co.

NORTH AMERICAN HAS BUILT MORE AIRPLANES THAN ANY OTHER COMPANY IN THE WORLD



FURY ON THE HIGH SEAS

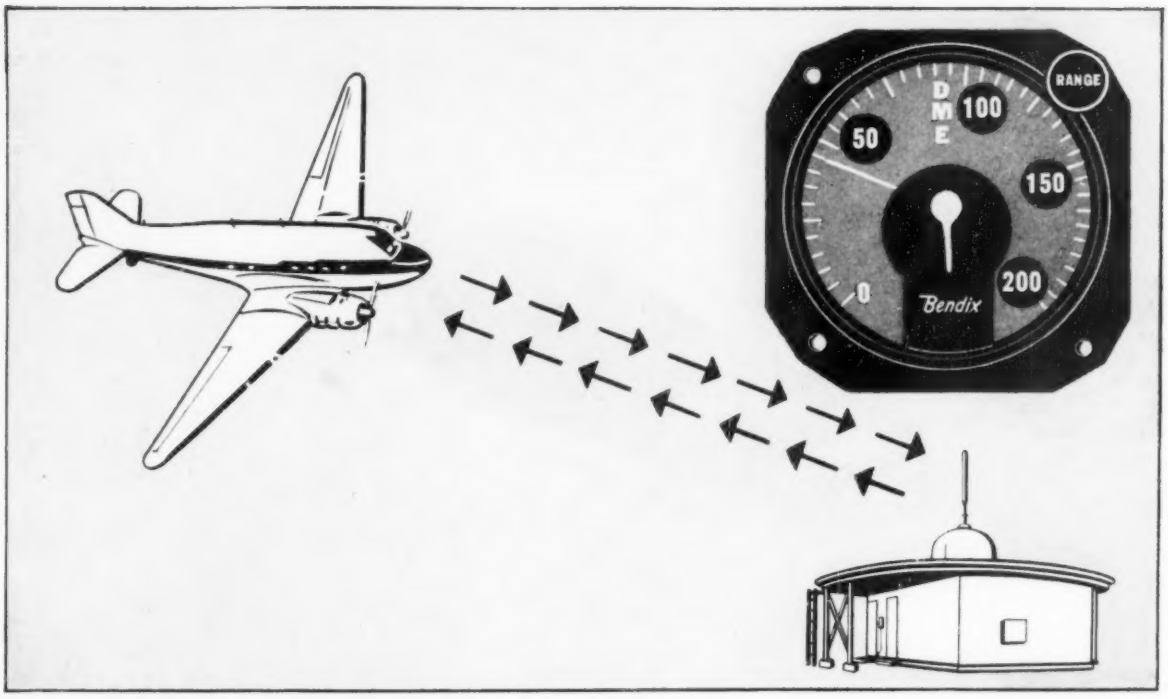
U. S. Navy FURY JETS . . . fast and rugged . . . mean new and greater striking force for this country's sea-borne airpower. Capable of speeds in excess of 650 miles an hour and armed with 20 mm cannons, swept-wing FURY JETS emphasize advanced Navy might in the air.

Latest of the FURY series to come off North American production lines is the FJ-3 . . . faster, more powerful companion of the Marine Corps FJ-2 . . . and the fourth in this growing fighter family, the FJ-4, is now going into production.

Research and development make North American foremost in aircraft, rocket engines, guided missiles, electronics and peaceful applications of atomic energy.

ENGINEERING AHEAD FOR A BETTER TOMORROW

NORTH AMERICAN AVIATION, INC.



NOW YOU CAN FLY COAST-TO-COAST ON FULLY COMMISSIONED DME GROUND STATIONS

Proved in flight Bendix* DME-5 Distance Measuring Equipment now enables any aircraft to fly from New York to California . . . from Canada to Mexico and know every mile of flight how far you are from the nearest ground station.

It means more accurate E.T.A.'s. Better holding patterns . . . holding can now be on actual distance covered, not on elapsed time. Opens up seldom used airfields. You can make direct flights over unmarked airways.

There's a Bendix distributor near you. Call or write. *Reg. U. S. Pat. Off.

THE NAME Bendix AVIATION CORPORATION MILLIONS TRUST

Bendix Radio

DIVISION OF BENDIX AVIATION CORPORATION, BALTIMORE 4, MD.
Export Sales: Bendix International Division, 205 E. 42 St., N. Y. 17, N. Y., U. S. A.
West Coast Sales: 10500 Magnolia Blvd., North Hollywood, California.
Canadian Distributor: Aviation Electric, Ltd., 200 Laurentian Blvd., Montreal, Que.

BENDIX AVIATION RADIO EQUIPMENT CAN BE PURCHASED FROM ANY OF THE FOLLOWING AUTHORIZED DISTRIBUTORS

Aerodex, Inc.
P. O. Box 123
International Airport Branch
Miami, Florida

Aircraft Electronics Co.
Box 730
Municipal Airport
Atlanta, Georgia

Aircraft Radio & Accessory Co., Inc.
Hangar No. 4
Stapleton Field
Denver, Colorado

Aircraft Sales & Service
5601 California Avenue
Seattle 6, Washington

Anchorage Airborne Radio
Merrill Field
P. O. Box 928
Anchorage, Alaska

Anderson Aircraft Radio Co.
Detroit City Airport
Detroit 5, Michigan

Atlantic Aviation Corp.
Teterboro Air Terminal
Teterboro, New Jersey

Atlantic Aviation Service, Inc.
P. O. Box 1709
New Castle County Airport
Wilmington, Delaware

Dallas Avionics
3300 Love Field Drive
Dallas 9, Texas

Grand Central Aircraft Co.
1310 Airway Drive
Glendale 1, California

Remmert-Werner, Inc.
Lambert Field
St. Louis 21, Missouri

Ohio Aviation Co.
P. O. Box 305
Vandalia, Ohio

Page Airways, Inc.
Rochester Municipal Airport
Rochester 11, New York

Qualitron, Inc.
Lockheed Air Terminal
Burbank, California

Skymotive, Inc.
O'Hare Field
Chicago International Airport
P. O. Box 448
Park Ridge, Illinois

Van Dusen Aircraft Supplies, Inc.
2004 Lyndale Avenue, So.
Minneapolis 5, Minnesota

NEWS DIGEST

Domestic

Nike guided missile system production will be continued by Western Electric Co. under a $164.8-million contract awarded last week by the U. S. Army. Meanwhile, approval was given to a $16-million project to prepare the Charlotte (N. C.) ordnance missile plant for Nike production. Output from a new and third source is scheduled to start next year under contract with Western Electric and Douglas Aircraft Co.

New convertiplane, Transcendental Aircraft Corp.'s Model L-G, has made several vertical flights, the New Castle, Del., company reports. The single-place research aircraft has two 17-ft.-diameter rotors that tilt 90 deg. for forward flight. The rotors, turned by a 160-hp. Lycoming O-290, are mounted on the convertiplane's wing tips. Estimated forward speed: 150 mph.

F-101A Voodoo, McDonnell Aircraft Corp.'s 700-mph.-plus twin-jet fighter, has completed the first flight of its experimental test program at Edwards AFB, Calif. Pacific Airmotive Corp. is furnishing personnel to service and maintain the F-101A during the trials.

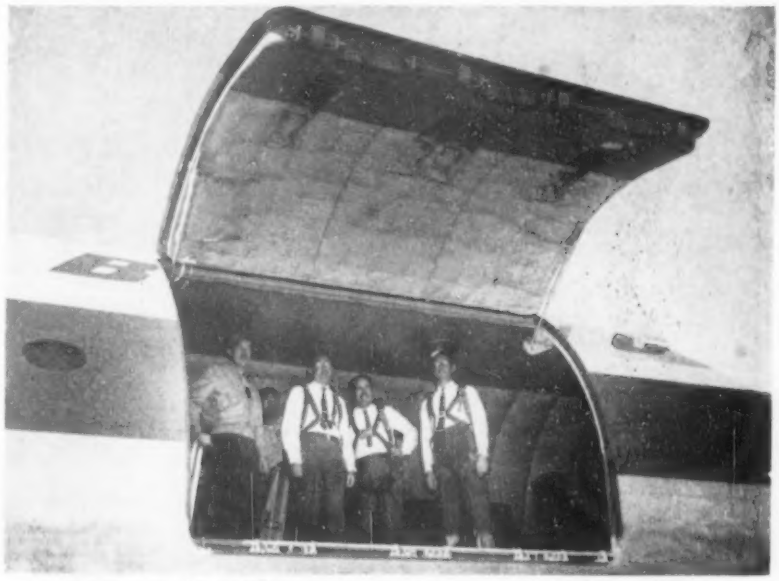
Lawrence D. Bell has resigned as general manager of Bell Aircraft Corp. to devote his full time to duties as president. Leston P. Faneuf is new general manager and treasurer; William G. Gisel becomes controller and secretary.

F-86H Sabre crash, in which Maj. John L. Armstrong was killed last month at the National Aircraft Show in Dayton, is blamed on structural failure. An Air Force spokesman says the accident followed failure of a wing tank bracket. Until a fix is provided, the plane will be redlined at 500 knots.

Robert MacLarren has been relieved as editor of Aero Digest effective Oct. 1 and has left the magazine. No successor has been named.

Boeing Airplane Co., Wichita, has been awarded a $10-million contract to implement production of the longrange B-52 jet bomber, according to a Department of Commerce synopsis.

Big push to accelerate the radar transponder beacon program for civil aircraft is underway, following an agreement on basis characteristics compatible with the military identification system. New L-band (1,000 mc.) beacon is expected to extend the range of ground surveillance radar to 100 mi. at 20,000 ft. and identify individual aircraft for ground controllers. CAA evaluation of the prototype beacon is scheduled for completion in March.



Boeing Jet Transport Averages 636 Mph.

Boeing Airplane Co.'s new Stratoliner-Stratotanker jet transport prototype recently averaged 636 mph. on a flight between Seattle and Portland. Carried as the plane's first passengers were (in shirtsleeves, left to right): William L. Allen, Boeing president; Edward C. Wells, vice president-engineering, and William G. Reed, a Boeing director. Pilot A. M. (Tex) Johnston stands at far left of the group, framed by the jet transport's large, upward-hinging cargo door.

Lt. Col. Julian B. Cross has been appointed director of the Office of Information Services of Air Materiel Command at Wright-Patterson Air Force Base. He succeeds Col. E. G. Morrison, who has been assigned to U. S. Forces in Turkey.

Charles S. Doran, 80, former president of Sperry Gyroscope Corp. and retired board chairman of Control Instrument Co., died Sept. 28 at Oceanside, N. Y.

Ryan Aeronautical Co.'s Metal Products Division received more than $7 million in new contracts for aircraft components and jet engine parts during September.

Dr. Edwin C. Schneider, 80, aviation medicine pioneer who developed the Schneider Physical Fitness Index, founded the physiology department of the School of Aviation Medicine at Mitchel Field and won the 1942 John Jeffries Award of the Institute of the Aeronautical Sciences, died Oct. 3 in Middletown, Conn.

Civil Aeronautics Board has turned down an Air Transport Assn. petition for changes in CAB rules governing airline flight engineers (AVIATION WEEK Apr. 5, p. 86). ATA felt some interpretation of the provisions could restrict a pilot's command and control over his aircraft. CAB has ruled against further oral argument in the squabble.

Financial

Delta-C&S Air Lines reports a net income of $1,305,949 for the year ended June 30, compared with $4,158,678 for the preceding fiscal period. The income included a $1,022,365 profit on equipment sales. Operating revenues increased to $50,333,862 from $32,337,802 last year.

International

New $103-million offshore order for Gloster Javelins and Hawker Hunters has been placed by the U. S. Air Force with Britain's Hawker Siddeley Group. This is the first U. S. order for the twin-jet Javelin; the Hunter already is in service with NATO forces.

WHEN YOU NEED THESE

BIG 12*

"FEATURES-OF-RESISTANCE" IN

fhp
fractional horsepower

AIRCRAFT AND MISSILE MOTORS
(AC or DC)

* 1 HIGH ALTITUDE
2 LOW TEMPERATURE
3 HIGH TEMPERATURE
4 HUMIDITY
5 FUNGUS
6 SALT SPRAY
7 VIBRATION
8 ACCELERATION
9 FUEL IMMERSION
10 PLUGGING
11 OVERHEATING
12 SHOCK

call for the assistance of our electrical laboratory and research engineers

In the meantime write for our new file folder catalog which lists units, with and without brakes and noise filters, that are ready for immediate production!

ELECTRO-AIRE
Incorporated
6909 Farmdale Avenue
No. Hollywood, Calif.

A Subsidiary of Hydro-Aire, Inc.

The Aviation Week

October 11, 1954

Headline News

CAB Asks $3-Million Subsidy Cut.... 13
Red Air-Sea Buildup Poses Threat... 15
German Pact Will Revive Industry... 15
Sneak Attack Defense Urged..... 16
Cut Pullbacks, AMC Tells Primes.... 17
GM Orders Draw Political Fire..... 17
ANDB Resuffles Staff..... 18
CAB Okays 2-0-2s, DC-3 for SWA.... 18
Job Shops Hard Hit by Pullbacks.... 21
Catroux Outlines French Air Policies. 22
No Airliner Turbines Yet: Hurley... 25
First-Flighter Poll Aims at Sales..... 25
ARDC Tests Downward Ejection Seat 27
AF Wants Copter Specs Standardized. 30
CAA Orders Fix on Ryan Navions.... 34

Aeronautical Engineering

Camera Reveals SBAC Design Details 38

Production

Rocket Launcher Made of Paper..... 40

Avionics

New Avionics Team Starts Fast..... 48
Cathode Ray Tube Shows Three Curves 56

Equipment

Experts Study Ignition Advances..... 66

Air Transport

Lufthansa May Fly Early Next Year.. 99
Copters Need New Traffic System.... 100
Why Be Half Safe?..... 102
British Await Comet Investigation .. 102
Sabena Calls IATA Fare Cut Steep.. 102

Editorial

Arming for Keeps 114

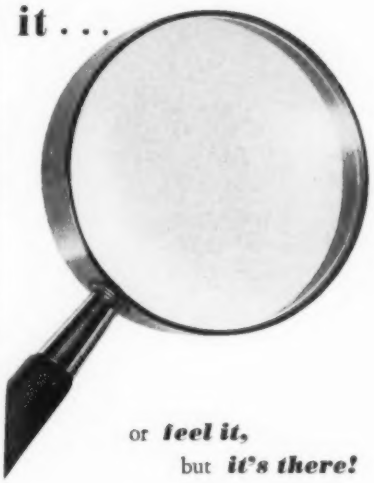
Departments

News Digest 7
Picture Page 9
Who's Where 11
Industry Observer 11
Washington Roundup 12
USAF Contracts 44
Navy Contracts 44
BuAer Contracts 47
Filter Center 61
Off the Line..... 80
New Aviation Products 83
Overseas Spotlight 90
What's New 96
Shortlines 102
News Sidelights 112
Aviation Calendar 112

Picture Credits

7—Boeing Airplane Co.; 9—Convair; 38—(bottom, left) Butler-Green; 39—(top; center-top, left) Butler-Green; (bottom, right) David Anderton; 66—Scintilla Division, Bendix Aviation; 90—McGraw-Hill World News; 95—de Havilland of Canada; 99-100—Sabena.

you may not see it . . .



or *feel it,*
but *it's there!*

Excessive moisture vapor causes corrosion, fungus growth and other damage within sealed containers.

When relative humidity is not controlled . . . Precision equipment corrodes and fails. Optical instruments fog and are temporarily useless. Electronic and radio equipment lose efficiency. Certain foods and drugs lose freshness or deteriorate.

DriAire offers proven solutions to many of these problems. As the largest manufacturer of moisture control devices, DriAire welcomes any problems of humidity control and indication. Your inquiries are invited.

DRIAIRE

DriAire
INCORPORATED
SOUTH NORWALK, CONNECTICUT

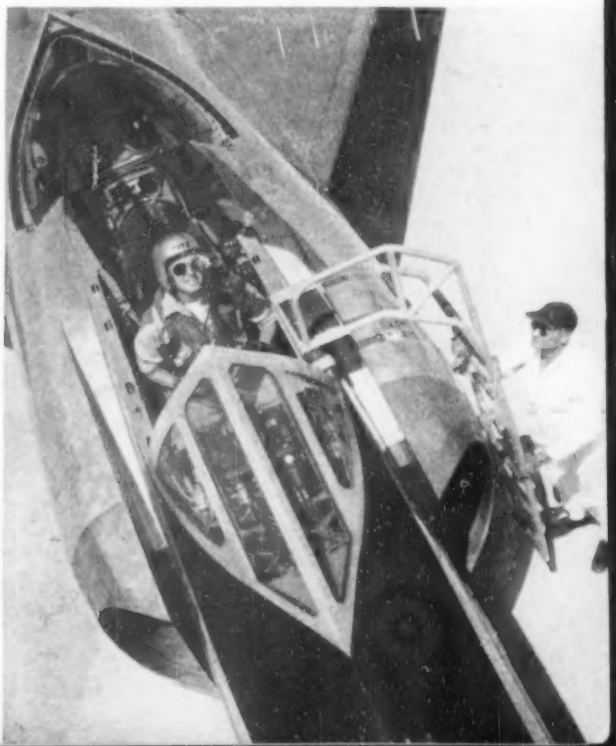
ROUND-THE-CLOCK interceptor is a big plane: 52 ft. long, 37-ft. span and 18-ft. high. Twin-cheek intakes feed 10,000-lb.-thrust-class P&WA J57.

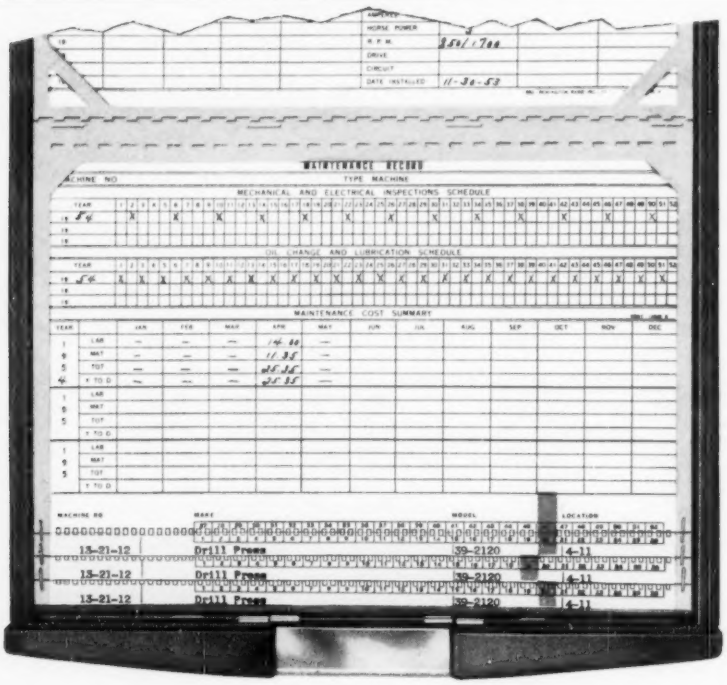
F-102 CLIMBS after pass over runway at Convair-San Diego. Afterburner gives the plane a high rate of ascent.

Convair Puts Delta F-102 Through Its Paces for USAF

PRIMING F-102 FOR TAKEOFF, Convair plane personnel man accessory equipment. Boom protruding from nose carries data gathering devices.

CONVAIR TEST PILOT J. M. Fitzpatrick, in the F-102's big cockpit, gets set for takeoff from Edwards AFB, Calif.





Integrated Preventive Maintenance Program Protects Capital Investment, Cuts Down-time and Product Costs

A well-integrated Preventive Maintenance Program will include: Equipment Records, Maintenance Parts Control, Written Work Orders, Work Scheduling and Executive Reports.

A Kardex Equipment Record (partially illustrated above) gives a complete machine history, at a glance. This record includes a history of depreciation, mechanical and electrical inspections, oil change and lubrication, plus a *maintenance cost summary*, to aid management decisions on machine replacement or retirement.

Written Work Orders are essential for planning job assignments and for correct cost accounting. They alert maintenance executives to all conditions affecting work to be performed, put an end to the errors and misunderstandings that result from verbal orders.

Your *integrated* system will aid in the preparation of Executive Reports. Here, visibly-signalled Kardex records have proved to be most efficient. More details on this phase, and on the entire Maintenance Control System, are yours in booklet X1383, offered in the coupon.

Tight Maintenance Parts Control Helps Reduce Inventory Investment, Production Stoppage, Overtime

With tight control over parts and supplies, scheduled maintenance and necessary repairs are expedited; production stoppage and overtime are held to a minimum. Maintenance parts records should list available balances on hand, usage and trend of usage, vendors, date and quantity of last order. Effective control includes a numbering system to eliminate duplicate items, cut inventory investment. Kardex Visible records, with movable Graph-A-Matic signals, save time by focusing attention on items nearing reorder point. See booklet X1383.

Sched-U-Graph Controls Maintenance Force Workload for Proper Job Sequence; Minimizes Lost Man-hours

To be effective, any preventive maintenance system will *plan* the workload for each member of the maintenance crew. The ideal method of workload scheduling is the *visible* method; the ideal visible tool for the job is the Remington Rand Sched-U-Graph.

Sched-U-Graph assures handling of maintenance jobs in proper sequence, for minimum interference with production. Sched-U-Graph tells the foreman, at a glance, what job each worker is on and how long

it should take, or, if he is free for immediate assignment. Result: Increased efficiency on the part of each worker, higher output, less waste. Further details on visible scheduling with Sched-U-Graph are contained in booklet X1383. Send for your free copy today.

Remington Rand

Room 2036, 315 Fourth Ave., New York 10

Yes, I'd like to have Booklet X1383.

Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State_____

1-21

Profit-Building **IDEAS** For Business

WHO'S WHERE

In the Front Office

Donald S. B. Waters has been elected president of Doman Helicopters, Inc., Danbury, Conn., also will become a director of the company and its Canadian subsidiary, Doman-Fleet Helicopters, Ltd. **Glidden S. Doman** will continue as board chairman and as new vice president-engineering.

Warren E. Kraemer has been appointed vice president-traffic and sales for Scandinavian Airlines System. **John Anderson** is new vice president-operations.

Robert H. Davies has been named vice president-engineering for Parker Appliance Co., Cleveland, Ohio, and its subsidiaries.

Barry B. Willis has been designated vice president-operations with Pastushin Aviation Corp., Los Angeles, Calif.

H. Webster Crum, formerly with Goodyear Aircraft Corp., has been appointed vice president-general sales manager of Avco Manufacturing Corp.'s Lycoming Division with responsibilities covering the Stratford, Conn., and Williamsport, Pa., plants.

Changes

Steadman Teller, USN (Ret.), has been appointed senior military advisor in the Dept. of Development Planning at Lockheed Aircraft Corp., Burbank, Calif. **Samuel T. Cohen,** nuclear weapons specialist, will evaluate development planning studies of atomic weapons research, and **Wilbur D. Snow,** specialist in research and development programming, joined the group.

Andrew J. Kutler has joined Stanley Aviation Corp., Buffalo, N. Y., as sales and service manager.

Rear Adm. A. J. Wellings, USN, (Ret.), is new technical consultant for Harvey Machine Co., Inc., Torrance, Calif.

J. D. Donaldson has been named sales engineer in Convair's commercial sales department, San Diego, Calif.

Dr. Clair M. Beighley has been appointed director of the Propulsion Laboratory, University of Michigan's Aeronautical Engineering Department.

Thomas F. Reinhardt, now chief engineer at Navy's Air Rocket Test Station, Lake Denmark, N. J., is leaving to join Bell Aircraft Corp.'s rocket section.

Charles Shuff, recently named director of Westinghouse Electric International Co.'s defense relations department, has his offices in New York, not Pittsburgh, as reported in this column Sept. 27, p. 10.

Honors and Elections

Frank N. Piasecki, board chairman of Piasecki Helicopter Corp., Morton, Pa., has been named first recipient of the Tribute of Appreciation Award of National Defense Transportation Assn., for his "outstanding contribution to defense transportation."

Warren Lee Pierson, board chairman of Trans World Airlines, has been given the decoration of Grand Officer of the Order of the Republic by the Italian government for his role in the rebirth of civil aviation in that country.

INDUSTRY OBSERVER

(This column was written by Aviation Week *editors who attended the SBAC flying display at Farnborough, the IATA meeting in Paris and visited European airlines and aircraft plants.)*

► British transport manufacturers expect changes in the Air Registration Board airworthiness requirements to result from the official Comet inquiry scheduled to begin Oct. 19 in London. Among changes anticipated are combined static tests of wing bending with fuselage cabin pressurization and the static testing of a prototype to destruction.

► **Rolls-Royce has sold the tiny Soar turbojet to USAF for the supersonic target drone being developed by Radioplane Co., a Northrop Aircraft subsidiary. Sale of the Soar was handled through the Aircraft Gas Turbine Division of Westinghouse which has a technical interchange and sales agreement with Rolls. The Soar delivers 1,810 lb. thrust for a dry weight of 267 lb. Westinghouse will modify controls on first 20 Soars to American standards and do research on modifying later versions to American standards.**

► While American aircraft and engine manufacturers have been plugging their products in Europe (Aviation Week Oct. 4, p. 11), British manufacturers have been accelerating their sales campaigns for the American market. Vickers-Armstrongs has hired American public relations and advertising consultants to plug the Viscount. Bristol has been talking with U.S. domestic airlines, including American and TWA, on its Britannia transport. A Rolls-Royce delegation headed by Lord Hives has been visiting Douglas, Lockheed and Convair officials on the West Coast discussing transport potential of the Dart and R.B. 109 turboprops and the Conway turbofan.

► **British Overseas Airways Corp. is becoming increasingly irked over official British policy of excluding the government airlines from competing for the profitable military troop movement air charters. Sir Miles Thomas, BOAC chairman, indicated recently he plans to push for a BOAC share of this business. In return, BOAC stands ready to assist nonscheduled British operators through use of its international operational facilities and already has begun to help Airwork in establishing its trans-Atlantic airfreight service.**

► Observers at the SBAC show noted that the large nacelles on the wing of the Valiant B.2 experimental prototype matched the shape of the new de Havilland Super-Sprite jettisonable rocket pods (Aviation Week Oct. 4, p. 11). De Havilland is plugging the Super-Sprite for takeoff augmentation enabling bombers to use smaller runways. Combination of the Super-Sprite nacelles and a much heavier landing gear on the B.2 indicates it has been designed to carry either heavier bomb loads or more fuel for longer range. Valiant B.1 production versions have been taking off lightly loaded from Vickers 1,300-yd. runway at the Brooklands plant.

► **Despite a series of optimistic public statements by British officials, their guided missile program still is lagging badly. British missiles are still a long way from operational use, even in the simpler anti-aircraft types. Informed industry opinion in both U.S. and England agrees that Britain will benefit most from the technical interchange recently engineered by Defense Secretary Charles Wilson and Minister of Supply Duncan Sandys (Aviation Week Aug. 2, p. 13).**

► Look for Vickers-Armstrongs, Ltd., to add the U.S. executive transport market to its Viscount sales push in this country, concentrating on companies that operate planes of the Convair 240-340 variety. Vickers could handle such specialized orders without interrupting normal fleet production lines by delivering business planes in "hull" form, leaving interior installations to U.S. conversion centers.

► **Negotiations by Air France and Union Aeromaritime de Transport with de Havilland for loss of revenues resulting from grounding of Comet are not being taken too seriously in European circles. Opinion is that the action was taken merely to insure a good trade-in price on their Comet 1s for later-model Comet 2s and 3s.**

Washington Roundup

Anglo-American Security

U. S. and British military authorities are coordinating security regulations and release of technical information on new aircraft and engines at top levels, but manufacturers on both sides of the Atlantic have well-justified complaints that bureaucratic decisions on these matters often place private corporations at a disadvantage with their competitors.

British Ministry of Supply, practically the sole source of British aircraft and engine development funds, tends to crack the whip harder over its manufacturers than the Defense Department. For example, MoS tries to clamp its security regulations on the few privately financed aircraft and engine developments in Britain even when they are aimed at purely commercial markets. U. S. manufacturers successfully have resisted Pentagon attempts to clamp this same lid on their own privately financed projects.

Defense Contract Publicity

Sharp contrast in Defense Department handling of contract announcements appeared last week with disclosure that Allison Division of General Motors Corp. has received $36.3-million order for 288 T56-A-1 turboprop engines. News was buried in columns of small type that make up daily Department of Commerce synopsis of procurement, sales and contract awards. There was no press release, no headlines.

Only four days earlier, special effort was made to publicize an award of $160.6-million tank contract and $855,000 missile order awarded to Chrysler Corp. This was shortly after Democratic Sen. Henry M. Jackson charged that General Motors is being favored by the Eisenhower Administration (see p. 17).

Cargo Troubles

Flying Tiger Line's decision that an all-cargo operation is not profitable could be a major blow to Seaboard and Western Airlines' case for a trans-Atlantic all-cargo service.

Seaboard spokesmen, though, do not concede this. They argue that the uneconomic rate competition from American and other scheduled airlines caused the domestic all-cargo operation to fail. This will not happen in the international field, they say, despite the fact that Civil Aeronautics Board does have authority to fix domestic rates, but does not have this authority over international rates.

Pressure from foreign carriers, through the IATA organization, Seaboard spokesmen reason, will prevent U. S. international carriers from engaging in an uneconomic freight rate war. Seaboard's application, approved by CAB, is now at the White House.

Radford on 'New Look'

Description of the Administration's defense program as the "new look" apparently is getting under the skin of Adm. Arthur Radford, chairman of the Joint Chiefs of Staff.

He offers another term: "evolutionary."

In a recent speech, Radford stated: ". . . I would like to set the record straight on the name given to our defense program. The title new look is actually a misnomer. Personally, I never use the term. It is not a single specific 'look,' nor is it fundamentally 'new.'

"Instead, it is evolutionary, taking into consideration the lessons we have learned in the past, and applying them carefully to an analysis of the future in the light of new developments and changes in the world situation."

Air Show Split

Special events staffs in Department of Defense and military public information offices are split over policy concerning air shows. One faction, including important Defense and Navy spokesmen, favors tightening of rules to forbid any participation in civic or privately sponsored exhibitions.

This would include the National Aircraft Show, the one big event given full support in the past. Proponents of this viewpoint maintain the Dayton show's return to military welfare funds does not warrant expense and effort to reach a limited audience and that more people would hear armed forces message through local programs at military installations.

Opposite viewpoint is taken primarily by the Air Force, which is prepared to fight for public spectaculars and argues they are justified both as a report to the taxpayer on USAF progress and in building up enthusiasm for flying careers among U. S. youth. USAF also feels that air shows are the only way it can demonstrate its ability but that they would be weak and over-costly if operated on a local rather than national basis.

The issue now is being debated in top public information circles at the Pentagon. Adding fuel to the fire is an insurance company's complaint that it has received claims totaling about $40,000 for broken windows and other damage suffered at Dayton over Labor Day. Most of this appears to have resulted from Army detonation of explosives.

In addition, some military men have their patience exhausted by unreasonable demands from small-town civic leaders for Cabinet-rank speakers and a full-blown air demonstration. One city recently threatened to take its case to Secretary Talbott because USAF offered to send a speaker "we never heard of." His name: Lt. Gen. Emmett "Rosie" O'Donnell, colorful hero of two wars and expert on strategic bombing.

Heliport Problems

Despite the ultra-cautious language and decisions emanating from the heliport committee of the Aircraft Industries Assn. Helicopter Council, the report released this summer is under fire and probably will be revised (AVIATION WEEK Aug. 9, p. 51). The report said it is too early for local communities to start building heliports, but urged civic authorities to lay plans for future helicopter service.

Air Transport Assn. now appears to disagree with some aspects of the recommendations and will meet with the council in Washington Oct. 26 to discuss details before the report is circulated widely.

ATA feels that the report went too far in telling communities what to plan for and fears that inaccurate predictions of what is ahead may damage both the manufacturers and the operators in their public relations. ATA's attitude is based, at least in part, on airline experiences with community airport problems since World War II.

—Washington staff

AVIATION WEEK VOL. 61, NO. 15 OCTOBER 11, 1954

CAB Proposes $3-Million Cut in Mail Pay

- **New formula gives best break to shorthaul lines.**
- **American, United, TWA would bear the brunt.**

By Katherine Johnsen

The 13 domestic trunk airlines face an overall reduction of more than $3 million annually in mail revenue.

Civil Aeronautics Board tentatively has established a new formula for computing "service" mail pay: 30.10 cents a ton-mile, plus a terminal charge for poundage enplaned. The terminal pay would range from $4.86 a pound at major airports to $14.58 a pound at small airports.

The Board set a deadline of Oct. 11 for airlines to raise objections and make alternative proposals.

▶ **Weight Base**—The new formula, by giving consideration to enplaning in the rate structure for the first time, generally favors shorthaul airmail carriers. One notable exception: Continental Airlines.

Although Continental comparatively is a shorthaul mail carrier, the weight of its enplaned poundage is low. Under the CAB proposal the terminal enplaning pay is based on weight.

CAL contends that it should be based on "numbers" of pouches. "It matters little to us whether we enplane a 10 or a 20-pound pouch," a Continental spokesman comments.

▶ **Cutting Costs**—Highlights of CAB's new mail rate proposal are:

- It would reduce the Post Office's cost for transporting mail from the present 46 cents a ton-mile to 41.46 cents.
- The yield to carriers would average 51.68 cents a ton-mile, instead of the present 53 cents.
- The mushrooming of high-density, lowcost coach flights, now carrying about 30% of the mail, largely accounts for CAB's proposal to reduce rates, according to Irving Roth, chief of the Board's Rates Division.

▶ **Bearing the Brunt**—Despite the overall reduction in mail pay that would follow from the new CAB formula, five of the 13 airlines would fare better than under the present flat ton-mile formula. They are Eastern, National, Braniff, Capital and Northeast Airlines. National's gain would be nominal. Capital and Eastern would profit most from the new rate proposal.

The reductions in mail pay to the eight other airlines, however, would exceed the increases to these five carriers by more than $3 million annually.

The brunt of the cut would fall on three of the "Big Four": American, Trans World and United Air Lines. Instead of the 45 cents a ton-mile these carriers now receive, the Board estimates that under the new formula their ton-mile yield would drop to 39 cents for American, 37 cents for TWA and 38 cents for UAL. If the new formula were applied to mail pay for fiscal 1954, CAB calculates that these three airlines would receive $3.3 million less than under the 45 cents a ton-mile rate.

Air carriers whose revenues would be hit sharply by the new service mail pay formula refrained from comment when it was issued by CAB, indicating a reluctance to provoke a contest in which the outcome might be worse.

▶ **Heavy Pressure**—Post Office Department has taken an official position that the service mail rate should be approximately 25 cents a ton-mile. Under the CAB proposal, the lowest estimated ton-mile yield to an airline would be 37 cents a ton-mile to TWA.

The Board's action to cut down the cost of transporting mail was taken in the face of heavy pressure from Congress and Post Office:

- A small, but vocal and aggressive group in Congress, led by Sen. John Kennedy, contends that the current service mail rates fixed by CAB contain an element of subsidy. They call for mail rates approximately airfreight rates —25 cents a ton-mile.
- Postmaster General Arthur Summerfield's primary objective is to put his department on a self-supporting basis. He still has a long way to go. From a peak deficit of $727 million in fiscal 1952, the department's deficit has been decreased to $594 million for fiscal 1954. Cutting rates to airlines is part of his campaign.

▶ **Doomed Proposal**—The multiple-element rate, proposed by eight shorthaul airmail carriers before the CAB's proposal was issued, appears dead. Recom-

New Service Mail Pay Rates?

Service mail pay of three of the "Big Four"—American Airlines, Trans World Airlines and United Air Lines—would be cut sharply under Civil Aeronautics Board's proposal to replace the present 45 cents a ton-mile, with a new multiple element rate.

The Board estimates its proposed rate for domestic trunk operations would save more than $3 million annually on Post Office Department's cost for transporting airmail.

Under a proposal recommended by eight shorthaul carriers, the service mail pay bill would be increased by nearly $3 million annually.

Details as to the effect of the two proposals on mail pay of individual carriers:

	Present ton-mile rate	Estimated ton-mile rate under eight-airline proposal	Estimated ton-mile rate under CAB proposal	Fiscal 1954 service mail pay	Under CAB proposal fiscal 1954 mail pay would have been	Difference
	(cents)			(in thousands)		
American	45.00	48.38	39.78	$7,559	$6,682	−$887
Eastern	45.00	55.39	47.29	3,050	3,205	155
Trans World	45.00	45.38	37.03	5,934	4,883	−1,051
United	45.00	45.91	38.04	8,956	7,571	−1,385
National	45.00	53.03	45.06	751	753	2
Northwest	45.00	46.36	39.15	1,475	1,283	−192
Braniff	52.66	67.79	56.19	928	990	62
Capital	46.80	66.42	55.54	1,030	1,223	193
Delta	51.00	59.81	50.31	1,583	1,561	−22
Western	50.00	56.33	49.19	803	790	−13
Colonial	75.00	77.29	67.84	115	104	−11
Continental	75.00	61.60	55.56	463	343	−120
Northeast	75.00	97.26	90.91	106	129	23

Subsidy Drop?

Civil Aeronautics Board estimates subsidies for overseas and international airline operations will decrease by $2.8 million in fiscal 1955, dropping to $46 million from $48.8 million in fiscal 1954.

Details from CAB's annual study on overseas and international service mail pay and subsidy:

	Fiscal 1954 subsidy	Fiscal 1955 subsidy	Difference
		(In thousands)	
TRANS-ATLANTIC			
PAA	$7,572	$7,063	
TWA	3,684	3,369	
Total	11,256	10,432	−$824
LATIN AMERICA			
PAA	11,344	11,485	
Braniff	2,557	2,179	
Delta-C&S	695	707	
Panagra	2,174	2,209	
Carribean-Atlantic	92	125	
Total	16,862	16,705	−157
TRANS-PACIFIC			
Northwest	3,858	3,303	
PAA	7,707	6,480	
Total	11,565	9,783	−1,782
HAWAII			
Hawaiian	578	577	
Trans-Pacific	290	147	
Total	868	724	−144
STATES-ALASKA			
Alaska Airlines	1,165	1,161	
Pacific Northern	888	1,145	
PAA	1,368	1,360	
Total	3,421	3,666	+245
INTRA-ALASKA			
Alaska Airlines	1,068	959	
No. Consolidated	1,140	1,083	
Pacific Northern	406	463	
Wein	1,161	1,221	
Alaska Coastal	341	312	
Byers	54	52	
Cardova	349	297	
Ellis	267	261	
Reeve	91	6	
Total	4,877	4,654	−223
INTERNATIONAL			
American	[illegible]	[illegible]	
Eastern	[illegible]	[illegible]	
National	[illegible]	[illegible]	
United	[illegible]	[illegible]	
Colonial	49	77	
Total	49	77	+28
Grand Total	$48,898	$46,041	−$2,857

mended by Braniff, Colonial, Capital, Delta-C&S, Eastern, National, Northeast and Western Airlines, it suggested a rate of 36.25 cents a ton-mile plus a payment of $114 per pound of mail enplaned.

Reasons why it seems doomed:

- It would result in an overall increase in the cost of transporting mail by nearly $3 million annually. Practically and politically, an increase in the mail pay bill seems out of the question.
- Four carriers—TWA, United, Northwest and Continental—are opposed to the proposal. Trans World, UAL and NWA would get very small portions of the $3-million increase. CAL would take a decrease.
- Five of the eight carriers that recommended the multi-element rate would get increased mail pay under the CAB proposal and are expected to support it.

▶ **Modest Increase**—Although the Board's proposal would result in a reduction in the government's cost of transporting the mail at service rates, it would result in a modest increase in the cost of subsidizing airlines.

According to CAB figures, support payments to the four subsidy-class domestic trunklines would be increased $46,600 in fiscal 1955:

- Service mail pay to Braniff would increase $63,800, decreasing the subsidy requirements by that amount. A mail pay increase to Northeast similarly would decrease the carrier's subsidy requirements by $23,000. The total decrease in subsidy requirement for the two carriers in fiscal 1955: $86,000.
- The two other subsidy-class airlines, Colonial and Continental, would have their service mail pay reduced. This would increase their subsidy requirement for fiscal 1955 by $133,400.

A sharp cut in mail pay to the domestic trunklines, which now seems destined, may result in a renewed drive for increases in passenger or freight rates—or both.

Subsidy Jump?

A $775,000 increase in the local service airline subsidy bill and a normal jump in government support of helicopter operations is expected by Civil Aeronautics Board during fiscal 1954.

The Board bases its forecast on these projected figures:

LOCAL SERVICE

	Fiscal 1954 subsidy	Fiscal 1955 subsidy	Difference
		(In thousands)	
Piedmont	$1,922	$1,931	
Pioneer	1,295	1,400	
Frontier	2,781	3,001	
Mohawk	1,021	1,135	
Southwest	1,102	971	
Allegheny	1,781	1,778	
Bonanza	922	912	
North Central	2,520	2,514	
Ozark	1,879	1,892	
Southern	1,901	1,920	
Trans-Texas	3,000	2,995	
West Coast	1,765	1,882	
Central	1,697	2,044	
Lake Central	1,509	1,495	
Total local service	$25,095	$25,870	+$775

HELICOPTERS

	Fiscal subsidy	Fiscal subsidy	
Helicopter (HAS)	$432	$438	
Los Angeles	758	855	
New York	1,457	1,392	
Total helicopters	$2,647	$2,685	+$38

TAC Gets First Supersonic F-100s

First operational North American F-100 Super Sabres are handed over to Tactical Air Command pilots from George AFB, Victorville, Calif., by NAA manufacturing vice president J. S. Smithson (second from right).

Pacific Commanders Tell Aviation Week . . .

Red Air-Sea Buildup Poses Threat

But U.S. hopes that fear of powerful retaliation will keep Communists from launching new aggression.

By A. W. Jessup

Tokyo—Recent strengthening of Communist air and submarine forces in the Far East has increased the worries of America's top leaders in the Orient. Gens. John E. Hull of the Far East Command and Earle E. Partridge of the Far East Air Forces are continuing to redistribute their ground and air units to present a strong "front" in the form of a formidable retaliation force.

In an all-out war, they do not have adequate forces to prevent Communist capture of important territory in the far Pacific. It is their hope that the threat of retaliation by American air units and mobile ground forces will deter the Reds from new aggressive attacks in Korea, against Formosa or in Southeast Asia.

▶ **Red Strength**—Gen. Hull, expanding the figures released earlier by Gen. Partridge (AVIATION WEEK Aug. 2, p. 12), told AVIATION WEEK that communist Far East air strength (Russian, Chinese and North Korean) of 7,000 to 8,000 aircraft includes 700 to 900 Ilyushin 28 twin-jet light bombers and "more Tu-4s than the total of B-29s which the U.S. threw against Japan in World War II." In addition, the Reds have large numbers of jet fighters—MiG-15s and MiG-17s, the improved fighter replacing the original MiG.

In addition to building a modern Asia air force, the Communists are pushing their ring of bases right up to the fringe of American outposts. Hull says they have constructed fighter fields only seconds away from the demarcation line in Korea. And they now have a base with 50 MiGs within sight of Japan on the southern-most island of the Kurile chain, only a few miles from the eastern tip of Hokkaido.

Two MiGs took off and patrolled over the Russian-held island when Gen. Hull's airplane recently flew along the Nemuro Strait, which separates Japan and Russia at that point.

Other Russian fields are located on southern Sakhalin off the northern tip of Hokkaido. From the Sakhalin and Kurile bases (others are spotted all along the chain), the Russians could put an umbrella of fighters over all of Hokkaido and the northern hundred miles of Honshu, Japan's main island. Included in this range are two major FEAF airbases: one near Sapporo on Hokkaido, one at Misawa on Honshu.

▶ **Concentrated Threat**—What particularly disturbs Hull is the size of the Red air forces.

"The Communists have much more strength concentrated out here than they need for the simple defense of Communist-held territory," he says.

In addition, the submarine force could become a great threat to American lines of communications to Japan and the Far East outposts. Hull notes, however, there has not been a threatening buildup of Red ground forces.

The Far East commander says American strength is adequate in the far Pacific—provided the Communists only continue their cold war tactics.

"There isn't enough to prevent the loss of important territory if the Reds want an all-out war," he states.

▶ **Major Deterrent**—Although sympathizing with the Korean complaints over the withdrawal of American air and ground units, Gen. Hull says the withdrawals actually strengthened the major U.S. deterrent to further Communist attacks upon South Korea.

He points out that it could lead to a major catastrophe if the bulk of American strength were based in the narrow confines of Korea. Red airpower, if properly used, could overwhelm U.S. and United Nations forces there.

By redistributing the air units to rear bases from which they will strike back in retaliation and by placing the ground units in positions where they can launch airborne and/or seaborne attacks against a wide selection of key Red areas, Hull believes his Far East Command is contributing the "maximum to the defense of Korea."

He also points to the expansion of the Republic of Korea army from 16 to its present 20 divisions, providing the same numerical ground force available to the U.N. command at the height of the Korean war.

He admits the physical airpower stationed in Korea is not in any way comparable. The ROK air force will get jets soon, but it probably will be years before they can provide an adequate air defense of South Korea.

▶ **Costly Turmoil**—Both the Far East Command and the Far East Air Forces were opposed to U.S. involvement in Indo-China. The FEC made its "strongest" recommendation against involvement to Washington.

It was the opinion in both headquarters that although it was theoretically possible to achieve a military victory if the U.S. was willing to commit major forces including American troops plus air and seapower, in the long run the political turmoil of Indo-China would lead to a costly defeat for the U.S.

FEAF generals unanimously condemn the incompetence of the French air force command in Indo-China. They believe the free world position is strengthened in many ways by the liquidation of the war that was "only a drain and waste of good American equipment in a futile struggle."

German Revival

- **Nine-power pact gives new life to plane makers.**
- **Five prewar firms ready to resume operations.**

The nine-power pact to rearm Western Germany, signed in London last week, will revive the Reich's dormant aircraft industry.

Under the prohibitions imposed by the four occupying powers, the once-mighty German industry lagged far behind the Western powers and Russia in research, design and industrial prowess. It will be free to manufacture all types of aircraft except missiles and strategic bombers after the London agreement is ratified.

▶ **'Aero Union'**—Familiar names like Dornier, Focke-Wulf, Heinkel, Messerschmitt and Daimler-Benz still exist on factories in Western Germany, and there is little doubt they will reappear as aircraft producers.

Now manufacturing such items as looms, gliders, sewing machines and automobile parts, these firms already have formed an "aero union" and have laid the groundwork for re-entry into the aircraft business.

Aero Union was formed in 1953 with the hope that permission would be granted to build planes for the new Lufthansa under license from U.S. manufacturers. This program fell through, and the German airline later ordered American Convair 340s and Lockheed Super Constellations (see p. 99).

▶ **Air Force Revival**—Plans for the German air force are not expected to differ greatly under the London agreement from those worked out earlier for the now-defunct European Defense Community. The Reich's military fliers are not expected to be an important part of the West's air defense setup for at least two and a half to three years.

It will take that long for the aircraft and crews to get ready for action. Main

problem is that the German air force of about 86,000 men will face a major training problem.

Probably less than a third of the West German pilots can be drawn from the ranks of World War II veterans and the remainder will have to start out with basic training.

Pattern set by EDC indicates that Germany will have an air force of about 1,300 planes, 1,000 of which will be tactical aircraft. The Germans are eager to get the latest models and it is expected that at least the fighter planes will be of U. S. design.

Under the EDC program, killed when ratification efforts failed in the French National Assembly, Germany's airpower was clearly defined. That program, according to State Department spokesmen in Washington, will be reworked during October and early November by teams of military experts now in Europe and presented for approval to the NATO Council.

► **U. S. Stockpile**—In Paris, Gen. Orval R. Cook, deputy commander in chief of U. S. forces, said "a lot" of American equipment had been stockpiled for Western Germany but that none of it would be turned over to the Reich until the nine-power London agreement has been ratified.

Cook's office disclosed that in the fiscal year ended last June 30 the United States awarded armament contracts totaling $612 million under the offshore procurement program in Europe. There was no breakdown showing how much of this was for aircraft.

Civil Air Switches To Nautical Miles

Commercial aviation has switched from statute miles to nautical miles to standardize distance units with the military services which have been using knots and nautical miles. But non-commercial aircraft pilots can take their choice.

Commercial airlines will use the nautical miles as a standard of speed and distance, and Civil Aeronautics Administration will issue information in knots and nautical miles. But non-commercial pilots can take their choice.

A nautical mile is 6,080.2 ft., a statute mile 5,280 ft.

Hackney Resigns

L. R. (Mike) Hackney is resigning Oct. 15 as executive vice president of Transport Air Group and has urged that the group merge its activities with Independent Military Air Transport Assn. since "the reasons which originally prompted the formation of TAG no longer exist." Present TAG members also are associated with IMATA.

Sneak Attack

- **Finletter says one Red strike can destroy U. S.**
- **Former AF Secretary urges realistic planning.**

A thermonuclear Pearl Harbor, in which Russia can "destroy in a single sneak blow the cities and industry of the United States," will be possible by 1956, says Thomas K. Finletter, former Secretary of the Air Force.

The ability of the United States and the North Atlantic Treaty Organization to meet this threat is seriously handicapped, Finletter claims, by these facts:

- The size of our military forces is not determined by needs based on foreign policy but by how much we think we can spend and how scared we are by the current situation.
- The composition of the military forces is not determined by a priority system based on the kind of war we may have to fight but by compromises or an agreement reached by the Army, Navy and Air Force on how they will split the valuable dollars.

► **Realistic View**—Finletter's ideas, many of them familiar to the aircraft industry since he was chairman of the President's Air Policy Commission in 1947, are outlined in a new book, "Power and Policy," published by Harcourt, Brace & Co. The volume goes at length into both military and foreign policy problems faced by this country and its allies.

He calls for new efforts to establish lasting peace but warns that until we have it a more realistic view of the atomic threat must be taken, regardless of cost.

The former Air Force Secretary is highly critical of what he calls the "division by services" system and indicates that the Department of Defense is going through an evolution that may lead to serious discussion of the idea of eliminating the Army, Navy and Air Force as separate services.

Finletter, however, believes the result would be an unwieldy organization, without morale and too much power concentrated in a single Chief of Staff. He is more inclined to favor two departments, an Army and an Air-Navy combination.

► **NATO Requirements**—Determination of a military budget, in Finletter's opinion, would be based on a priority list of the forces necessary to defend democracy. He would start with NATO's needs:

- **NATO atomic-air**, a combination of strategic and tactical aircraft. He would put the Strategic Air Command and the Tactical Air Command into a new outfit, substituting STAC for SAC and TAC, to carry out atomic counterattack on all kinds of targets.
- **Air defense** of North America and other NATO areas.
- **Ground, sea and non-atomic Air Forces** the U. S. would contribute to NATO.

Cost of this program to the United States, Finletter estimates, would be $26 billion annually for the first four years. This is about $10 billion more than we will spend for arms that will contribute to performance of NATO's mission and does not include foreign military aid for member countries or atomic energy.

► **U. S. Needs**—In a breakdown for our own armed forces, Finletter forecasts the need for a priority system with these categories:

- Atomic-air striking force, with strategic and tactical missions in one command. This calls for more and better planes, better protection of aircraft and bases and more emphasis on research and development.
- Greatly improved air defense.
- Regional defense in the Pacific area.
- General purpose forces.

The 1955 program provides $28.8 billion in new money for Army, Navy and Air Force obligations. Finletter would raise this to $33 billion, giving substantial increases to the first two categories.

The Air Force share of the $28.8 billion is $11.4 billion. He believes this should jump to $18 billion or $19 billion and says if it does not, "the presumption is almost conclusive that we are still not preparing for the terrible threat before us."

► **Priority System**—The author believes the Air Force has been correct in its resistance to giving a super-priority to Air Defense.

"If we look at the overall airpower problem and not just at the admittedly desirable end of having a good air defense," he says, "the question becomes one of priorities.

"I have said that I believe the NATO atomic-air (STAC) should come first because if we fail to build it to the overwhelming level, we will give up our main hope for preventing atomic war."

Finletter says only a proper priority system can insure adequate air defenses. If we get them, he adds, the rate of kill on Russian planes in case of attack can be raised to 50% and it is worth the price.

In addition to airpower, Finletter goes at length into diplomatic problems, including the struggle against Communism in the "gray areas," countries outside of NATO that still make up much of the frontier between freedom and slavery.

Cut Pullbacks, AMC Tells Primes

Procurement director says Air Force is determined to keep small business in the production picture.

Large prime contractors facing cuts in U.S. Air Force orders are under strong pressure from Air Materiel Command not to strangle small business by pulling in work subcontracted to firms with fewer than 500 employes.

Prime contractors usually argue, says Maj. Gen. David H. Baker, AMC director of procurement and production, that the work in the plants is going down and they must reduce subcontracting to keep their own labor force busy.

"We cannot buy that argument," Gen. Baker says. "We realize that retrenchment is sometimes necessary and that we can't have any hard and fast rules, but we ask that you fully consider all the aspects before you decide to retrench."

▶ **Tough Obstacles**—Gen. Baker put renewed emphasis on his viewpoint late last month at a Chicago meeting of representatives from 200 major companies in 25 states holding Air Force contracts worth $14.5 billion.

He was frank in his declaration that the Air Force has a couple of tough obstacles to overcome in its effort to keep small business in the procurement picture.

As subcontractors and suppliers to major prime contractors, small companies were paid $1 billion in fiscal 1954, compared with $2.8 billion in fiscal 1953 (AVIATION WEEK Sept. 27, p. 19).

Major reasons for this trend, Gen. Baker told the Chicago meeting, are:
- Retrenchment by prime contractors.
- The increased complexity of Air Force equipment, more and more of which is out of the realm of small business capability.

It was made clear that AMC is determined to force utilization of small business facilities wherever possible.

"The small business policy of the Air Force is the policy of the people of the United States," Gen. Baker told the contractors. "Congress formulated this policy and the people elect congressmen, so we consider it the policy of the people."

▶ **Clause With Teeth**—The Air Force puts teeth in the policy by means of a clause in prime contracts calling for a maximum amount of subcontracting to small business so long as it does not interfere with efficient production.

Baker said a recent AMC review of existing agreements showed only about 1% were disapproved for failure to comply with the regulation. But, he added, in 5% to 10% of the cases the company was questioned and in most cases realized that it had "gone overboard."

The general pointed out that if prime contractors pull in their work they will lose valuable help and skills maintained by subcontractors (also see p. 21). It is no secret in AMC and Pentagon offices that USAF is concerned about the possible loss of these sources which should form an important part of AMC's production potential.

In the event of an emergency, AMC believes, there must be a broad subcontract base and procurement officials feel strongly that USAF, not the prime contractors, must determine this base.

In his Chicago talk, Baker said AMC considers the present number of subcontractors "inadequate" and made it clear that his office will continue to press for a broadening of the production base.

▶ **Public Relations**—Also speaking at the Chicago meeting was Col. A. W. James, director of procurement and production for the San Antonio Air Materiel Area. He stressed to the prime contractors the public relations value of small business subcontracting, urging them to tell the public how work and money is spread around by the system.

Other speakers were Kennard Weddell, chief of the Air Force small business office, USAF headquarters; Maurice L. Johnson, executive for small business, AMC headquarters; Victor J. Ripp, small business specialist for the Chicago Air Procurement District, and Maj. Gen. William O. Senter, commander of the Oklahoma City Air Materiel Area, host for the meeting.

Another meeting, for East Coast prime contractors, will be held in New York Oct. 20. Roger Lewis, Assistant Secretary of the Air Force for Materiel will head the list of speakers.

New Bid Chance

Small business firms in search of defense contracts now can get new value out of Commerce Department's daily synopsis of proposed procurement, sales and contract awards.

Changes in the armed forces procurement regulations make it possible for the Army, Navy and Air Force to publish proposed procurements in the synopsis before they issue invitations to bid or requests for proposals.

Previously, plans for procurement were not disclosed until bid sets—including specifications—were ready to be sent out to companies on the established source list. Under the new system, all firms have a chance to spot the item in the synopsis and get 10 days to request a bid set.

Another new advantage for small business is that a military prime contractor now may use the Commerce Department synopsis to list his specific needs and the desirable location of prospective subcontractors.

The synopsis is published daily, Monday through Friday.

GM Defense Orders Draw Political Fire

Final months of the 1954 congressional campaign opened last week with strong indications that the Democratic Party is determined to make a political issue of defense contracts awarded to General Motors Corp.

Secretary of Defense Charles E. Wilson, former president of GM, on a visit to President Eisenhower at the Denver White House, said charges by Democratic Sen. Henry M. Jackson evidently are politically motivated.

And, the Secretary added, "The ethics of it seem to be of a little lower order than I am used to in business."

▶ **'Settled Policy'**—Wilson had replied earlier to Jackson's initial criticism with a statement that most contracts finalized in the first 18 months of the Eisenhower Administration had been negotiated or placed on letters of intent during the Truman regime (AVIATION WEEK Oct. 4, p. 18).

Sen. Jackson charged that the Pentagon, since the Eisenhower Administration took office, had a "settled procurement policy" of concentrating defense work in GM. He said General Motors had been given $1.7 billion in contracts in the first 10 months of the GOP regime while contracts with all other auto manufacturers had declined $395 million.

Jackson later returned to the attack with a statement that Wilson's answer "does not square with a number of vital facts." He cited the Secretary's testimony before a Senate committee to the effect that the Truman program had been gone over item by item and had been changed where economies were possible.

Wilson replied to this, on the eve of his conference with the President, with a charge that "the senator just doesn't know what he is talking about."

▶ **Lower Bids**—Meanwhile, Air Force Secretary Harold E. Talbott, apparently unaware of the cross-fire under way in Washington, told 57,000 Studebaker-Packard employes in South Bend, Ind.: "I sincerely hope the Air Force will be able to use the facilities of the Stude-

baker-Packard Corp., to maintain the finest Air Force in the world."

Developments since Wilson replied to Jackson's charge:

• The Army announced that Chrysler Corp. has been given a $160.6-million contract to build medium tanks. The bid was $7.6 million lower than the GM bid.

• Chrysler also was awarded a supplemental $855,000 contract to tool up for limited production of the Redstone surface-to-surface guided missile.

• Democratic Sen. Paul Douglas declared that award of the Chrysler tank contract was due to Democratic pounding and "constructive criticism."

▶ **Rocket Power**—The Redstone missile is not a new Chrysler project. The $855,000 contract to start limited production brings the total of contracts covering developing and production to more than $22 million. These were awarded to Chrysler in increments, the last for $8.6 million in June.

Named for the Army's Redstone Arsenal, where an ordnance team of German scientists headed by Werner Von Braun designed and perfected the weapon, the missile will be powered by a rocket engine manufactured by North American.

The Redstone will be manufactured at a Navy-owned jet engine plant in Warren, Mich., originally built for production of the Pratt & Whitney Aircraft J48 turbojet.

ANDB Reshuffles Staff To Speed Air Projects

The Air Navigation Development Board has reorganized its permanent staff and added three new members well known for work in this field, two moves intended to speed development of improved navigation and traffic control techniques and systems.

Col. J. Francis Taylor, Jr., ANDB director, says the board intends to give "an appreciable amount of attention" to projects that will provide more immediate improvements in the current air traffic control situation, a policy sure to evoke cheers from airlines.

▶ **Stepped-Up Program**—Evidence of ANDB's stepped-up program is the fact that the agency will obligate $4.5 million during the current fiscal year, more than four times last year's figure, Taylor says.

Approximately 80% of this will go for air traffic control projects, the balance for air navigation. However, no new navigation projects will get underway until the Vortac committee has made its report on the current DME-Tacan controversy and the ANDB has reached a decision on the matter, Taylor indicates.

▶ **Experienced Additions**—The three new members of ANDB's permanent staff are:

• **James A. Anast,** former technical director of Wright Air Development Center's directorate of flight and all-weather testing and onetime chief of the automatic flight branch.

• **Sam P. Saint,** former director of the Air Transport Assn.'s Air Navigation and Traffic Control Division.

• **Chester S. Bartholomew,** former engineer for Civil Aeronautics Administration, acting as liaison between CAA's Technical Development and Evaluation Center (TDEC) and the ANDB.

▶ **Staff Reorganization**—Col. Taylor has divided the ANDB staff into three functional groups:

• **System Requirements,** headed by Bert Denicke. This section will work with all interested civil and military agencies to establish operational requirements for future ANDB projects. Denicke was ANDB's executive secretary.

• **System Engineering,** under Anast. Members of this group will determine how new operational needs fit in with existing programs and developments, then draw up engineering characteristics (specs) for new programs.

• **Project Coordination,** under Bartholomew. This new team will follow ANDB developments being carried out by CAA, USAF, Navy and Army.

Taylor expects the new System Requirements group to enable ANDB to cut the delay between the time an operational need first appears and the date when it gets funds to launch the necessary development.

Evaluation of ANDB developments will be carried out by CAA's TDEC, although not necessarily at the center's Indianapolis facility, Taylor says.

▶ **Overall Budget**—Funds for the ANDB-sponsored programs will be provided in the overall budget of each of the four agencies, instead of transferring such funds to the group as in the past.

The board hopes to divide its programs approximately equally among the four agencies, Taylor says, although he admits the Air Force probably will get a preponderant share because it does the lion's share of such work in the Defense Department. (In the ANDB's fiscal 1955 budget, USAF has approximately 60% of the total, CAA 22% and the rest divided between the Navy and Army.)

ANDB's choice of a military service to handle one of its programs will be determined largely by which originally sponsored the developments for the ANDB program, Taylor says. He believes most ANDB projects will have military antecedents.

▶ **Important Techniques**—Recognizing many important new techniques that could prove useful in the Common System are being developed in Lincoln Laboratories and other air defense development centers, Taylor hopes to add an ANDB staffer who will be stationed at Lincoln Labs.

D. K. Martin, former ANDB director, is the new deputy director of the reoganized staff, and Bruce Montgomery is continuing as a member of the System Engineering group.

Airmail Savings

The surface-mail-by-air experiment has saved letter writers nearly 10 billion hours of delivery time, Air Transport Assn. reports.

A substantial portion of letters reach their destination an average of 11 hr. 30 min. sooner than if surface transportation had been used.

Scheduled airlines cooperating in the program flew 9.6 million ton-miles of mail, ATA says, and the Post Office Department received $29.5 million from the public for the service.

Post Office paid the air carriers $1,830,000 for flying the mail and retained $27,670,000 for its own services.

CAB Okays 2-0-2s, DC-3s for Southwest

Civil Aeronautics Board has approved Southwest Airways' mixed fleet of DC-3s and Martin 2-0-2s in setting mail rates for the local service airline.

The rate proceeding was started in July 1953, when Southwest claimed the mail rate established for it no longer was adequate. The Board has awarded the company $1,106,628, or 50.16 cents a ton-mile, for the period July 22, 1953, to June 30, 1954, compared with $1,042,919 forecast under the last rate.

▶ **Traffic Decline**—Southwest will get $1,039,033, or 45.52 cents a ton-mile annually, commencing July 1, 1954.

The airline has had a substantial decline in traffic because of the recent shutdown of three military installations on its routes, but these losses should be offset by increased fares and normal traffic growth in the future, CAB says.

▶ **Higher Revenues**—In investigating the use of a mixed fleet, the Board found that judicious use of Southwest's nine DC-3s and three 2-0-2s enabled it to realize substantially higher passenger revenues per mile than it would have earned with an all-DC-3 service.

Mail pay need from July 22, 1953 to June 30, 1954, for the mixed operation was $1,106,628, while an all-DC-3 operation it would have totaled $1,115,306.

CAB says findings favoring use of mixed fleets for local service airline apply only to the Southwest case and are based on its particular circumstances.

Convair builds the world's most advanced aircraft through...

Engineering to the Nth power

NAVY'S XFY-1 TAKES OFF AND LANDS ON A DIME

Here's a new kind of aircraft for America's aviation arsenal...the Convair XFY-1, a vertical takeoff, delta wing Navy fighter. Powered by a turbojet engine, it is one of the world's fastest propeller driven planes.

The XFY-1 is as responsive as a hummingbird over a rose bud. It rises nose-up like a guided missile ...flies like a fighter at speeds beyond 500 mph...hovers motionless...darts forward, and sideways...backs down on its tail to a feather-light landing.

This remarkable aeronautical achievement is another result of Convair's engineering for the *maximum* degree of performance... the Nth degree of air power...

Engineering to the Nth power

CONVAIR

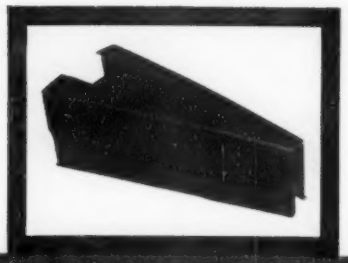
A DIVISION OF GENERAL DYNAMICS CORPORATION

ANY SHIP BECOMES AN AUXILIARY AIRCRAFT CARRIER WITH THE XFY-1 ON DECK!

ANY FIELD, EVEN A BACKYARD, IS AN AIRBASE FOR THE XFY-1!

ANY PLACE WHERE FIGHTER-BOMBERS ARE NEEDED, THE XFY-1 CAN OPERATE!

OMOHUNDRO PRODUCES FIBREGLASS PARTS FOR THE McDONNELL F3H-2



THE McDONNELL "DEMON" adds another great name to the lengthening roster of outstanding aircraft for which Omohundro facilities in fibreglass have contributed component parts.

With the addition of two powerful presses with 36 x 48 inch and 48 x 72 inch platens and 96 inches open height, to its highly specialized equipment for the production of fibreglass parts, Omohundro is now even better equipped to turn out, with speed, precision (and *economy*), the most difficult shapes and sizes — in volume production, if needed.

For specific information and quotations, contact Paul Omohundro Company, Box 696, Paramount, California. TOrrey 6-7001.

OHUNDRO

Southern Representative: C. P. Waggoner Co., Box 1107, Grand Prairie, Texas

Trends in Subcontracting—Third in Series

Job Shops Hard Hit by Pullbacks

Airpower stretchout forces about 100 small firms out of business; others live on primes' 'trickle downs.'

By William J. Coughlin

Los Angeles—The job shop with fewer than 500 workers, doing little engineering and depending upon contracts from prime aircraft manufacturers for its existence, is being hard hit by an economic readjustment in the subcontracting level of the aircraft industry.

It has been estimated that as many as 100 of these firms have been forced out of business in this area in the past year.

▶ **'Trickle Down'**—"Small business has never been able to properly protect itself," says the head of one of these firms. "They have never had representation where it counts.

"At present small business lives by the 'trickle down system.' The present thinking is, 'What helps big business helps small business.' We of small business know this is not true."

These companies are not concerned with the intricate workings of the weapons systems concept; they are not concerned with any threat to research and development efforts of their bigger cohorts in the subcontracting business. What they are concerned with is a stretchout, with prime aircraft plants pulling work back into their own facilities to keep busy.

They are uneasy over a government policy that tells them one month they are necessary to the nation's mobilization effort, forces them out of business the next month, then comes around the third month to seek their help.

These are not companies able to weather periods of cutback. They do not possess the financial reserves.

▶ **Normal Portion**—Referring to the stretchout, Lloyd G. Hallamore, president of the Hallamore Manufacturing Co. of Long Beach, Calif., says: "Such a program undoubtedly has merit—provided that the major prime contractors would continue to subcontract to small manufacturers that portion of the work that would normally be subcontracted under full mobilization.

"Unfortunately, however, the cutback and stretchout of some defense programs find major prime contractors with open time in their own facilities, some of which are government-owned. Their management can decide to pull back work that had planned to be subcontracted to smooth out their in-plant operations.

"In some cases, there is even an expansion of the prime contractor's facilities to do the work that under mobilization would have been subcontracted."

Some subcontractors believe that during slack periods government-owned facilities at prime plants should be kept as standby.

"We believe that a policy should be outlined to major prime contractors that work, which under full mobilization would be subcontracted, cannot be done in a government-owned facility but must be subcontracted," says Hallamore.

▶ **Production Reserve**—Many of the small subcontractors feel they are being overlooked in government planning. They want to be included in mobilization planning and regarded as an integral part of the nation's production reserve.

"From our standpoint this is very important," says Hampden Wentworth, president of Longren Aircraft of Torrance, Calif. "Present mobilization planning does not include the subcontracting strata of small defense plants.

"I have asked prime contractors why they do not rely on their subs in their mobilization planning programs. The answer is invariably that 'we do not dare to rely on our subcontractors because on Mobilization Day some other contractor might have the sub's facilities tied up.'

"Therefore, the prime contractor excludes qualified subcontracting facilities in his mobilization planning and, when asked what he would need to triple production, his answer is in terms of more plant space and equipment for his own facilities.

"If the powers for defense planning follow this type of thinking and continue to ignore the subcontract strata, a great reservoir of specialized knowhow and skill will be lost to the defense effort."

▶ **Profit Incentive**—Wentworth asserts that present policies penalize a prime contractor as inefficient unless he is using every bit of plant space and equipment assigned to him.

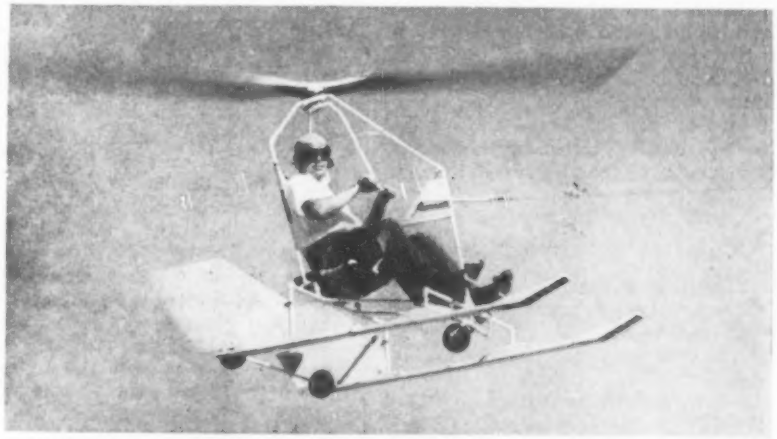
"It is my belief," he says, "that the prime should be given a profit incentive to maintain as large a part of his assigned facilities as possible on a standby basis, while utilizing subcontractors' skills in the most efficient manner.

"Such teamwork between the prime contractor and the sub, if properly carried out, would greatly reduce the need for additional government facilities during peak periods."

▶ **Dollar Trouble**—Part of the alarm of the subcontractors over the reduction in subcontracting results from confusing dollar volume with percentage figures. This confusion has caused some fears about what is believed to be a dangerous trend away from small business.

Percentagewise, small business is better off today than it has been since the Korean war in its dealings with USAF. It is in dollar volume that the trouble lies.

Speaking in percentages, the small business portion of total Air Force



Benson Offers 'Build It Yourself' Copter

Any person handy with tools can build a replica of this 100-lb. single-seat Gyro-Glider with $75 worth of materials readily obtainable from local sources, says its designer, Igor Benson, president of Benson Aircraft Corp., Raleigh, N. C. When towed by boat or car, it requires eight horsepower for level flight; on release, it glides at sinking speed of 15 feet per second. Empty weight is 103 lb., and it can carry 250-lb. payload, Benson claims. Its 20-ft. diameter rotor turns at 360 rpm. Benson's firm sells plans and kits for the Gyro-Glider, plans to add engines to the packages.

spending more than doubled in fiscal 1954 (AVIATION WEEK, Sept. 27, p. 19). During fiscal 1953, small business obtained 4.3% of the Air Force spending. In fiscal 1954, this went up to 9.8%.

But in 1953, Air Materiel Command spent more than $14 billion. In 1954, AMC spent only $5.6 billion. The direct dollar volume for small business dropped more than $52 million.

► **Prime Pullbacks**—Of much more concern, however, was the slash in the volume of subcontracting by prime airframe contractors. This is the major source of income for small business in the aircraft industry and therefore the major source of alarm in the present situation.

The figures tell the story of what happened. In fiscal 1954, the prime manufacturers took a cut of some 62% in the dollar volume of their prime contracts with AMC, a drop of about $8.5 billion. In that same period, the dollar volume of the business subcontracted by the airframe plants was slashed by 74%.

To maintain the same subcontracting pattern, the amount of the cutback for the subcontractors should have been the same as for the prime manufacturers —62%.

In fiscal 1953, prime contractors received about $13,599,544,000 in prime contracts from AMC, passed along about $4,078,800,000, or roughly 30%, of this to subcontractors. In 1954, the prime contractors received $5,135,717,000 from AMC, passed along about $1,078,800,000, or roughly 20%.

The difference, 10%, represents the size of the "pullback" of business from subcontractors into major plants.

► **Combined Cut**—This percentage of pullback might have caused little concern among subcontractors if the remaining dollar volume had stayed high. But combined with a cutback that reduced the total amount subcontracted from $4 billion in fiscal 1953 to only $1 billion in 1954, it has created grave misgivings. Many subcontractors tend to forget that without any pullback whatever the dollar volume of their business still would have been slashed $2.5 billion.

Nevertheless, the 10% pullback cost the subcontractors some $500 million —no small sum.

To counteract the feeling against this, both Aircraft Industries Assn. and Air Force have taken steps to publicize the fact that subcontractors still get about 20 cents out of each USAF dollar that goes to a prime manufacturer, in addition to the direct contracts the subcontractors receive from Air Materiel Command.

► **Labor Problems**—Capt. Leland Webb, vice president and western regional manager of AIA, lists two reasons for the pullback:

• Labor contracts of the prime manufacturers are such that they would face union trouble if they attempted to lay off large number of workers.

• The primes want to hold onto their skilled workers, having learned from experience that once employes leave they often are lost to the industry.

► **Counter Pressure**—At the same time, however, Air Force has made it plain it is against any tendency of airframe producers to pull component manufacture back into their plants to offset their own contract losses. USAF wants subcontract facilities maintained.

Pressure from subcontractors also is

Catroux Outlines French Air Policies

PARIS—Military Aviation in France, coming back strong in the past few years after a lengthy period of post-war inactivity, is fast developing to the point where top French authorities are confident their air force can be counted on as one of the mainstays in NATO European air defense organization.

At an informal meeting here, French Minister for Air Diamede Catroux told Aviation Week publisher Robert W. Martin and associate editor Frank Shea that this rebuilding has been accomplished in the face of an ever-tightening government economy program, with limited funds allotted to military aviation.

"Specialization has been the saving grace," he said, pointing out that under the overall NATO air defense plan the FAF mission is built solely on fighter-interceptor aircraft with no actual requirement for heavy bombers.

Under the NATO plan, said Catroux, FAF's basis mission is divided into the following categories:

- Interception of enemy aircraft.
- Short, tactical bombing runs.
- Tactical support for troops, evacuating personnel, etc.
- Development of guided missiles.

"The NATO plan," he pointed out, has enabled us to concentrate both our development and production capabilities in one general direction, and we believe, as a result, that we have been able to come up with some pretty good fighter-type aircraft."

Chief types cited by Catroux were the Dassault Mystere 4, Fouga Magister, Sncase Baroudeur and two Sncaso types —the Vautour and Trident.

The Mystere 4, equipped with a Verdon engine (Hispano Suiza version of the Tay) that develops 7,720 lb. thrust, presently is being phased into squadron service.

Plans are for the Verdon engine to be replaced by an axial-flow Atar 101E, built by the nationalized company Snecma. This engine will develop about 7,300 lb. thrust with an afterburner, upping this by about 20%. The modified version will be known as the Mystere 4B and is approximately a year off yet.

The Fouga Magister, now entering production, is an advanced trainer powered by two Turbomeca Marbore engines with 880 lb. thrust. Production plans call for manufacture of about 100 of this type.

Approximately 80 Sncaso Vautours also are on the FAF production schedule. This is a ground support aircraft powered by two Atar 101B engines with 5,280 lb. thrust, giving it enough speed for supersonic flight in a shallow dive. First Vautours are scheduled to enter squadron service about 1956.

The Sncase Baroudeur, powered by an Atar 101C with 6,160 lb. thrust, takes off with rocket assist from a tubular steel carriage and lands on skids. It is a flexible plane, with ability to land on ordinary plowed fields, sand beaches or grass. A pre-production series of five now is nearing completion.

Another Sncaso model for which the FAF has high hopes is the Trident, a small, light aircraft designed for defense of small, critical areas. Its two Turbomeca Marbore engines develop 880 lb. thrust each, with two tail rockets expected to raise its speed to Mach 1.6. This aircraft still is in the development stage.

Catroux emphasized that the overall trend within FAF is for development of lighter weight fighter-interceptor types, making the fairly prevalent observation that "U. S. and British manufacturers hang entirely too much weight on their aircraft, hindering performance accordingly."

The French minister also is a firm believer in the premise that all-weather, night fighter-interceptors should be equipped with two engines, holding that the capability is vastly increased and the risk proportionately reduced.

In France, Catroux is regarded as symbolizing a new youthful era in French aviation, marked by progressive thinking. At the comparatively young age of 37, he has won widespread respect for intensive devotion to his duties.

Although a member of a flight crew in FAF during World War II, Catroux did not become a pilot until he was appointed Minister for Air. He now has a considerable number of flight hours, including much jet time. He claims that this serves him in good stead, permitting him to fly throughout France and North Africa to visit various manufacturers and FAF installations as his own pilot.

ANYTIME....

And anywhere . . . he's ready, willing and able . . . what's more he's particularly well armed to repel any force that threatens the security of free nations. ➢➢ Trained to the highest possible degree and supplied with equipment to complement this skill, the U.S. Air Force pilot is qualified to carry on the enviable tradition of America's airmen. To the vital end of building aircraft in line with such need, for more than a generation REPUBLIC has dedicated its full resources. ➢➢ The ***F-84-F THUNDERSTREAK*** *is youngest in the dynasty of Thunder-craft . . . But it's already a veteran of many thousands of operational hours. Flexible as a rapier in the hands of Cellini and tough as a Toledo blade, the* ***THUNDERSTREAK****'s performance is equally dependable at hill-top level or 45,000 feet. This puts in the control of our airmen and our allies in the N.A.T.O. a quicksilver sentinel of civilization.*

CEILING UNLIMITED *for the young ambitious man . . . new vistas of education, travel and security . . . all these are available to career airmen in the U.S.A.F. Every day you're in brings you greater satisfaction in the knowledge that yours is a vital and rewarding service to your country . . . to yourself.*

REPUBLIC AVIATION

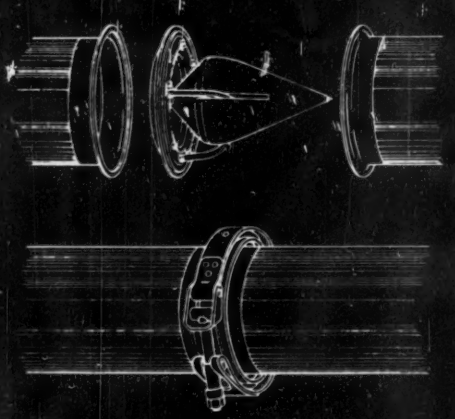
FARMINGDALE, LONG ISLAND, N. Y.

Designers and Builders of the Incomparable **THUNDER-CRAFT**

MARMAN *IN-LINE* CHECK VALVE

An Outstanding Advance Built-in "damping" eliminates flutter due to high velocity air flow... In-line design permits maximum flow with minimum air resistance... Cone shaped valve body is inert to distortion by temperatures ranging from -325° F to 1000° F.

For All Standard Tubing Sizes While it is adaptable for use with other flange types, utilizing a Marman J-11 coupling, the check valve may be inserted in place of the self-aligning seal as shown in small illustration. Marman filters may also be applied in this manner.



MARMAN

MARMAN PRODUCTS COMPANY, Inc. 11214 EXPOSITION BLVD., LOS ANGELES, CALIF.

Marman products are manufactured under various U. S. and foreign patents and other patents pending

piling up on the members of Congress. This pressure, of course, is transmitted to Air Force and, in turn, to the airframe manufacturers.

Small businessmen, hard hit by cutback, stretchout and pullback, are ready to fight for what they want.

(Next: The new organizations)

First-Flighter Poll Aims at Higher Sales

A poll showing a good percentage of first-flighters on Northwest Orient Airlines' overseas and domestic services will help salesmen break down an important facet of resistance to air travel, NWA reports.

Air travel experts explain that passengers often back out because they fear they would betray their inexperience as first riders among a planeload of veterans and be embarrassed. This psychological quirk has stopped many from taking the "plunge" and buying a ticket.

NWA's poll shows that about one in six of its passengers are aloft for the first time. Approximately 16% of all aircoach passengers on domestic flights and 14% on trans-Pacific services have never flown before, the airline says. These figures can be used by sales personnel to allay a prospect's fears that he would be the only first-flighter abroad and be conspicuous.

Turbines Not Ready For Airliners; Hurley

Jet and turboprop engines for airline transports are being held back by lack of operating experience and inflight safety knowledge, says Roy T. Hurley, president of Curtiss-Wright Corp.

He told an Aviation Writers Assn. meeting in New York that in addition to lack of experience, turbojet power for commercial airliners is being delayed because this type engine is not efficient below sonic speeds.

▶**'Too Fast'**—"The British moved too fast," Hurley claims. "We need more experience and background before turboprops and jets will be ready for the airlines."

In addition, the Curtiss-Wright chief warns, airline operation of the turboprop in its present stage of development will increase costs per seat-mile.

He says the current powerplant "best suited for jobs and the speed range" required of present large airliners is Wright's Turbo Compound engine.

▶**Turboprop Noise**—Speaking of the noise problem predicted for turboprop transports, Hurley says "the only hope" for reducing this is to trim the propeller tips.

But the tip cuts would reduce propeller efficiency by 2% to 3%, he adds, and "we in the industry hate to say we'll take anything short of peak efficiency."

▶**Future Speeds**—Hurley also forecasts these speed capabilities for engines:

- Turboprop, 800 mph.
- Turbojet, 1,500 mph.
- Ramjet, 3,500 mph.
- Rocket, 3,500 mph. and faster.

Australian Sabres Trickle Off Lines

(McGraw-Hill World News)

Sydney—A trickle of North American-designed, Australian-built Sabre jet fighters is coming off the production lines and preparations are being made to ready operational squadrons.

Sabres are sent from the factory to a fighter operational training base.

Three-Blade Props Aid Widgeon Performance

New Hartzell three-blade props mark the latest approved version of Grumman's "Super Widgeon" business plane conversion by McKinnon-Hickman Co. Also featured are new Lycoming G0480-B powerplants at 270 hp. each, replacing former 260-hp. Lycoming G0435s. Shorter blades of three-blade prop provide smoother, quieter performance, also are less effected by water spray. "Super Widgeon" cruises at 160 mph. at 60% power, takes off from water in 10 sec. Conversions at the firm's New York or Portland bases take one month. Cost of complete conversion approximately $30,500.

career opportunities in

Nuclear

AIRCRAFT

PROPULSION

for Engineers • Physicists
Chemists • Metallurgists

Here's a genuine opportunity if you are an engineer or scientist who wants to build a sound, well-rewarded career in private industry.

We are engaged in a development program on a reactor-powered aircraft engine. Because of this, we have an immediate need for engineers and scientists with training or experience in nuclear engineering or related fields—Thermodynamics, Heat Transfer, Controls, Reactor Physics, Theoretical Physics, Physical Chemistry, Stress and Vibration, High-Temperature Metallurgy.

If you can qualify, we can offer you an opportunity to work for us on one of today's most challenging assignments—a chance to be in on the early development of a great and revolutionary advance in aircraft propulsion.

At Pratt & Whitney Aircraft you'll be working for the world's foremost designer and builder of aircraft engines, on a project that will give you a *real* chance for professional growth and recognition.

Please send us immediately a complete resumé covering your training and experience. Write Mr. Paul Smith, Employment Office.

PRATT & WHITNEY AIRCRAFT
Division of United Aircraft Corp.
East Hartford 8, Connecticut

"Gunner to Pilot . . . two fighters . . . turning in!"

No TIME to repeat this message. He must get every word right the first time.

In today's higher-speed, higher-altitude bombers, crewmen must quickly grasp every code-word passed. Speed of intercommunication has to keep pace with speed of operation.

Working since 1947, RCA engineers have developed the AN/AIC-10—an intercom system which meets Air Force requirements for high intelligibility under conditions of extreme noise and altitude. RCA noise-discriminating microphones have two faces which "balance out" extraneous noises, transmit sounds *only* from the speaker's mouth. Unique filter, amplifier and automatic volume control circuits reduce the effect of extraneous noise. Altitude-compensating headsets maintain sea-level sensitivity at 40,000 feet or more—and give crews maximum head comfort.

Now in full production, the AN/AIC-10 is but one of many complete electronic systems RCA has developed for the Armed Forces. RCA engineering —from original planning to final production—assures greater efficiency, effectiveness and safety in operation.

300,000 Spotters Wanted. Men, women volunteers for Ground Observer Corps to help the Air Forces search for hostile aircraft, man Air Defense filter centers, do many Air Defense team jobs. 200,000 patriotic Americans are now serving. Contact your local Air Force Office.

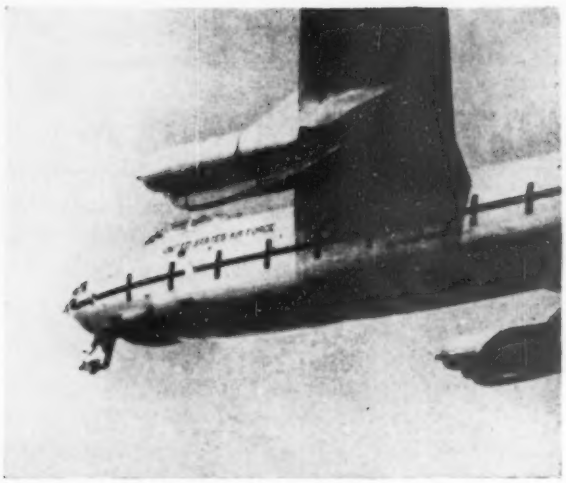
RCA

GOVERNMENT DEPARTMENT

RADIO CORPORATION of AMERICA

ENGINEERING PRODUCTS DIVISION

CAMDEN, N.J.



1. Downward ejection seat, carrying ARDC volunteer, pops out of bottom of B-47 nose while jet is flying faster than 500 mph.

2. Fully erect seat clears B-47's belly radome. This seat is the navigator's. Other stratojet crew members eject straight up.

3. Ejection seat begins tumbling forward after it is well clear of plane's belly.

4. Seat is upside down. Automatic devices will separate man from seat, open chute.

5. Into Gulf of Mexico goes ARDC volunteer. Four volunteers made 17 jumps.

ARDC Tests Downward Ejection Seat

6. In anti-exposure suit, volunteer floats in water waiting pickup by rescue boat.

7. Capt. Edwin G. Sperry climbs aboard rescue boat and heads for dry clothing.

Downward ejection seat, built by Stanley Aviation Corp., Buffalo, N. Y., was made necessary by construction features of B-47, B-52 and other proposed USAF planes. Before Capt Sperry and other WADC volunteers made test jumps over Gulf of Mexico, 73 trials were carried out with dummy pilots in the seat.

Project engineer for all phases of the test program was Kenneth F. Hecht, assisted by E. Frank Jones, both of WADC's aircraft laboratory. Lt. Ira M. Barash, of the aero medical laboratory, was medical officer for the project, and F. J. Beaupre, equipment laboratory, was in charge of the parachute equipment used by the jumpers.

That's the promise Wilcox has made to scheduled, non-scheduled and government airlines—here and abroad — and kept for more than 22 years!

When you invest in Wilcox communication or navigation equipment you know — that wherever you are — the signals from this equipment will help you get where you're going and help you land . . . safely.

A recommendation: contact Wilcox first.

dependability

any time . . . anywhere!

You are invited to write for complete specifications.

wilcox

ELECTRIC COMPANY, INC.

Fourteenth and Chestnut

Kansas City 27, Missouri, U.S.A.

Type 99
Multi-Frequency
Transmitter

Frequency: 125-525 kc/s; 2-20 mc/s; 118-132 mc/s. (Frequencies to 152 mc/s available on special order.)

Type of emission: Telegraph (A1); Tone (A2); Telephone (A3); Teletype (F1).

Power output: 400 watts LF and HF; 250 watts VHF.

Simultaneous operation of two channels modulated or three channels, A1 or F1.

The CAT—Type 441
Computing Automatic Tracker

Tells pilot when he's off course, when and how much to turn to get back on.

Obtains heading and position information from stabilized compass and localizer receiver equipment, automatically computes steering course signal to follow.

Instrumentation not disturbed.

VOR VHF Omni-Range

Meets ICAO, Annex 10 specifications.

Bearing accuracy within 1½°.

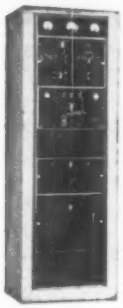
Uses Alford non-rotating slot antenna, thus eliminating all moving parts.

Available in two power ranges: Type 482, 50 watts. Type 483, 200 watts.

Complete, with everything required, including shelter, in one package.

Available as single or dual installation

Type 396 Transmitter Station



Frequency ranges: 2-13 mc/s or 118-132 mc/s.

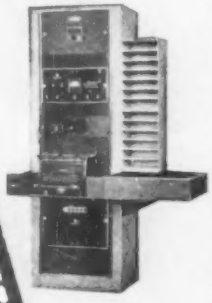
Power output: 250 watts.

Modulation: 100%, Class AB^2.

Noise level: 45db below 100% modulation.

Power requirement: 220 volts, AC—50-60 cycles.

Type 428 Packaged Complete VHF Station



Transmitter:

Frequency range: 118-132 mc/s.

Power output: 50 watts.

Antenna: 52 ohms, coaxial.

Coaxial relay provides automatic antenna transfer between transmitter and receiver.

Power requirements: 110 volts, AC—50-60 cycles.

Receiver:

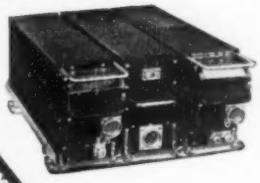
Frequency range: 118-136 mc/s.

Sensitivity: 1 microvolt for 8db signal-to-noise ratio.

Spurious response, including image: 100 db.

A.V.C. characteristics: 4db, 1 microvolt to 1 volt.

Type 440 VHF Airborne Communications System



180 channels, 118-136 mc/s.

Transmitter output: 50 watts.

Sensitivity: 2.5 microvolts, input produces full audio output.

Selectivity: 6 db; Not less than 35 kc/s. 60 db; Not more than 140 kc/s.

Spurious responses, including image:

Not less than 90 db at low end of band.

Not less than 75 db at high end of band.

A.V.C. characteristics:

Not more than 2 db rise, in 3 mv to 0.1 volt input.

Not more than 2 db rise, in 0.1 volt to 1.0 volt input.

Type 429 Glideslope Receiver

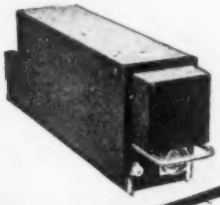
20 pre-tuned channels 329.3 to 335.0 mc/s.

Superheterodyne with dual conversion. **A.V.C.**—Audio within —2db to +0 db from 40 to 100,000 microvolts.

Harmonic Distortion—less than 10%.

Undesired Responses—75 db over range 70 to 1700 mc/s.

Selectivity — 6 db; Not less than 135 kc/s. 60 db; Not more than 450 kc/s. **Input**—52 ohm coaxial.



Type 96 Series Transmitting Station

Frequency ranges: 2 to 26 mc/s, or 125-525 kc/s.

Power output: 2500 watts.

Type of emission: A1, A2, A3 and F1.

Simultaneous operation of two channels modulated or three channels, A1 or F1.

Manufactured to JAN specifications.

Power requirements: 220 or 380 volts, AC—50-60 cycles.

THE
NORDEN
DIGITAL CONVERTER

In answer to the far reaching cry for a simple, accurate means of transposing mechanical information into comprehensible numerical digital notation, the Norden Digital Converter, now available, ranks supreme.

UNAMBIGUOUS OUTPUT OF 13 BINARY DIGITS, LOW TORQUE LOAD
Requiring no additional equipment, this unit, with an unambiguous output of 13 binary digits (total count of 8,192), instantaneously converts shaft position information into direct digital notation. The torque load of the input shaft is 0.2 in-oz.

MINIMUM SIZE, MAXIMUM ACCURACY
Weighing less than 7 ounces, only 1.75" in diameter and 2.75" long, the Norden Digital Converter is able to maintain accuracy within ±0.006% . . . or 1 count in 16,384.

CLOCKWISE OR COUNTER CLOCKWISE OPERATION
Either D.C. or pulse-operated, the converter can be wired to supply an increasing count for either clockwise or counter clockwise rotation. Where requirements necessitate an output greater than 13 binary digits, a special unit can be designed.

COUNTLESS APPLICATIONS
With a possible rate of 25,000 counts per minute, the uses of the Norden Digital Converter as a counting device are innumerable. It may be used to convert shaft position to digital notation or as an output device for shaft positioning.

In an era when scientific achievement is attaining unprecedented heights, there is no end to the ways in which the use of Norden precision products can simplify the search for progress . . . from the smallest, most sensitive element to the expansive, Navigational, Fire Control and Bomb Director systems.

NORDEN Precision Products

NORDEN TEMPERATURE PROBES

designed for all-weather operation in the sub-sonic and super-sonic range.

NORDEN PRECISION REDUCTION GEAR BOXES

designed for maximum performance with minimum weight and ultra-precision.

NORDEN SYNCHRO ALIGNMENT SETS

designed for accurate laboratory and production alignment of synchros and resolvers.

NORDEN COMPUTER TEST SETS

are designed and manufactured to meet exacting requirements.

THE NORDEN LABORATORIES CORPORATION
Milford, Connecticut

Australia Plans Three All-Weather Airfields

(McGraw-Hill World News)

Sydney—All-weather military airfields capable of handling any planes built are to be built at Darwin, Port Moresby (New Guinea) and Manus Island by the Australian government—a reaction to the Far Eastern crisis.

The airstrip at Port Moresby's big Jackson Field will cost $250,000. The steel mats laid during World War II will be removed and replaced by concrete.

Civil aviation planning also is stirring under the effects of the cold war. The Indo-China incident has pushed the Communist frontier closer to the back door of Singapore, stepping stone from Australia to Asia and Europe.

Australia, therefore, is eying a chain of bases across the Pacific far to the south for a new southern service via Auckland, Tahiti, Acapulco (Mexico), Miami, Bermuda to London.

USAF Wants Copter Specs Standardized

U. S. Air Force is promoting a new study of helicopter design specifications aimed at unification of military and civilian requirements, reports Brig. Gen. Marvin C. Demler, assistant deputy for technical operations of the Air Research and Development Command.

Demler says single design specifications, if approved by the armed forces and Civil Aeronautics Administration, "should result in a reduction in cost of the basic article, simpler evaluation procedures, an immediate source of supply of aircraft in the event of an emergency and an elimination of extensive modification of 'off-the-shelf'-type aircraft when procured for military use."

▶ **Advances Needed**—Addressing a meeting of the American Helicopter Society and the Institute of the Aeronautical Sciences in Washington, the general said many advances are needed in helicopter design and equipment if progress of the art is to keep pace with the past few years.

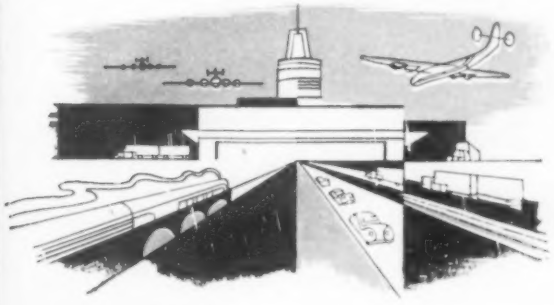
In addition to design criteria, he says the Department of Defense is working toward standardized methods of development and testing for rotary-wing aircraft. Progress is being made in the military specifications for transmission design, ground testing, flying qualities and structual design requirements.

Gen. Demler places special emphasis on the need for instruments and equipment that will make all-weather flight practicable. He points out that only limited night and instrument flight is

WE HAVE LEARNED A LOT ABOUT TITANIUM SINCE 1949

in 1949 American Welding started experimental work on Titanium and in 1950 accomplished the first successful production flash butt-welding of Titanium.

today The use of the "wonder metal" is largely restricted to aircraft use. American Welding annually produces thousands of Titanium rings for jet engines.



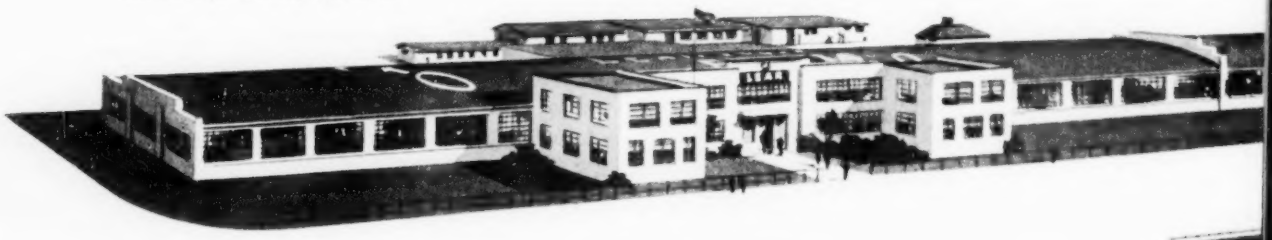
tomorrow Who knows — Titanium may be used as widely as aluminum—perhaps even in your product. One thing is sure—welding will continue to be a practical and inexpensive method of fabricating.

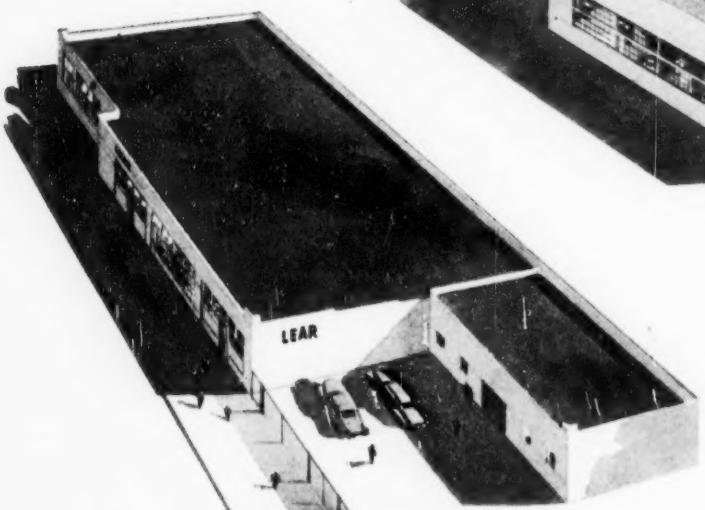
WELDING • MACHINING • FABRICATING

AMERICAN WELDING

GRAND RAPIDS HANGAR – Installation of Lear products; airplane modifications, conversions, and overhaul work.

LEAR-ROMEC DIVISION (Elyria, Ohio)
Manufacture of aviation and industrial pumps and radar pressurizing equipment.





LOS ANGELES BUILDING – West Coast field service headquarters for Grand Rapids and Lear-Romec Divisions.

LEAR

...for

EXECUTIVE OFFICES

ELECTRO-MECHANICAL

Linear, Rotary and Servo Actuators; Screwjacks; Flexible Drive Equipment; Magnetic and Fastop Clutches; Sub-Miniature Motor-Generators; Motor Driven Precision Gear Mechanisms; Precision Aircraft AC and DC Motors; Servo Motors; Automatic Electronic Temperature and Positioning Controls.

AUTOMATIC FLIGHT CONTROL

Automatic Pilots (commercial and military); Automatic Approach Couplers; Automatic Rudder Controls; Automatic Altitude Controls; Gyros for Control Mechanisms; Remote Reading Gyro Instrument Systems; Rate Gyros; Yaw Damper Systems; Missile Controls (stabilization and maneuvering).

GRAND RAPIDS DIVISION – Manufacture of electro-mechanical equipment, instrument products, and automatic flight control systems.

SANTA MONICA HANGAR – Aircraft prototype engineering; modifications and conversions; aerodynamic, electronic, and photographic research.

SANTA MONICA BUILDING – Home of two divisions:
LearCal (aircraft radio, autopilots, and other electronic assemblies);
Research and Development (commercial and military projects).

FACILITIES

aviation's precision needs

3171 S. BUNDY DRIVE, SANTA MONICA, CALIFORNIA

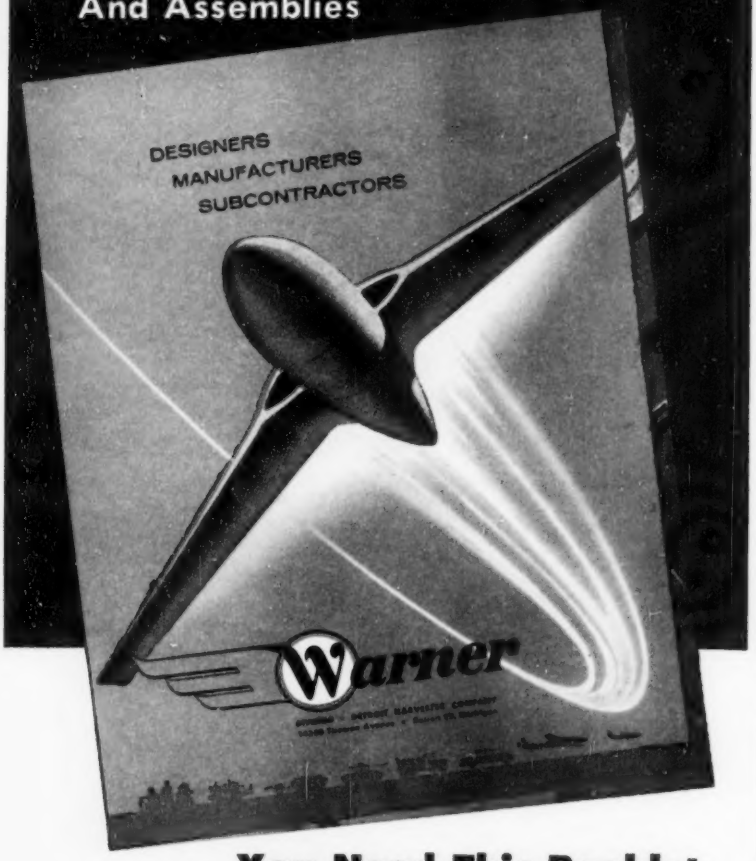
PUMPS AND PRESSURIZATION

Fuel, Oil and Air Pumps; Air Motors; Rotary Hand Pumps; Fluid Regulator Valves; Water Injection Pumps; Airborne Air Compressors; Centrifugal and Turbine Pumps; Aircraft Pressurization Assemblies for Radar; Camera Vacuum Pumps; Pneumatic Motors; Absolute Pressure Switches; Dehydrators.

RADIO AND NAVIGATION

Aircraft Communications (VHF, MF, and LF receivers and transmitters for airline and executive aircraft); Omnirange Navigation Equipment (OmniMeter—needle presentation, and Omniscope—picture presentation); Aircraft and Marine Automatic Direction Finders; VHF Airport Communications; Marker Beacon Receivers; Aircraft Antennae.

If You Are Looking For A Precision Subcontractor For Intricate Parts And Assemblies



. . . You Need This Booklet

The Warner Division of Detroit Harvester Co. has moved into a new and larger manufacturing plant. This expansion places Warner in a position to take on additional precision subcontracting work for aircraft and ordnance plants.

Capitalize on Warner's ability to manufacture to exacting tolerances. Consider Warner for the production of—

Landing Gear Cylinders, Pumps, and Valves
Hydraulic and Pneumatic Assemblies
Aircraft Fittings
Machining of Aircraft Forgings

Send today for your copy of the illustrated booklet shown above describing Warner's complete facilities. Warner engineers will welcome the opportunity to discuss your requirements with you.

Warner DIVISION OF DETROIT HARVESTER COMPANY
14300 TIREMAN AVENUE • DETROIT 28, MICHIGAN
DESIGNERS AND MANUFACTURERS OF HYDRAULIC PUMPS • VALVES • ACTUATORS

Warner Branch Offices

520 West Ave., Room 212, Norwalk, Connecticut
56 Canterbury Drive, Dayton 9, Ohio
2422 Forest Park Blvd., Fort Worth, Texas
7227 West 90th St., Los Angeles 45, California

possible in current copter models.

"However," he says, "these helicopters cannot be successfully operated in excessively turbulent air, in conditions conducive to accumulation of ice on airfoils, rotor head and control mechanisms, nor at speeds below approximately 40 mph."

▶ **Problems**—To increase helicopter speed, range and payload, Gen. Demler points to a list of problems facing design engineers:

- Parasite drag must be reduced with better fairings, cleaner fuselages and retractable gear.
- Higher blade tip speeds are needed. Rotor design and boundary-layer control as well as wings to provide lift are fields for further research.
- The problems of blade flutter and fatigue of rotor components and blades must be solved as rotors become larger.
- More progress is necessary in the application of fiberglass and plastic materials to rotor blades.
- More simple controls, including a reduction and balancing of control forces are needed to improve performance, stability and safety.
- New designs to cut structural weight can save material, reduce costs, ease maintenance and increase service life.
- Improved instruments must be provided to facilitate navigation and stability during slow flight and hovering.

CAA Orders Fix On Ryan Navions

Civil Aeronautics Administration has issued an Airworthiness Directive (54-18-1) saying all four-place Navion personal or business planes should be inspected for looseness of the wings at the fuselage connections due to elongation of bolt holes.

The condition was detected during inspection of a number of Navions. CAA says inspection should be made not later than Oct. 15.

▶ **Detection**—The wing looseness can be spotted by removing the wing fillets and applying a sharp fore-and-aft shaking force to the wingtip, according to the directive.

If there is opposite motion between wing and fuselage, immediate action must be taken. If wings and fuselage seem to move as a mass and feel "solid," the modification may be delayed until the next annual inspection.

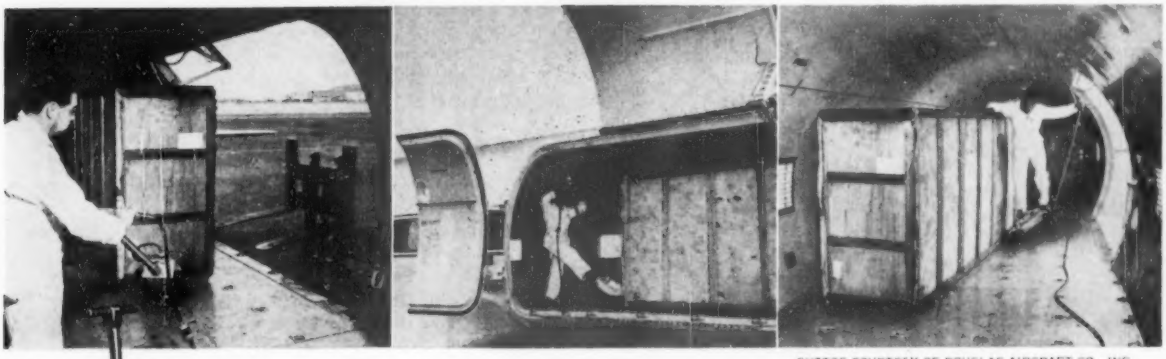
▶ **Correction**—CAA outlines steps to be taken in correcting the Navion's condition. A Field Service Bulletin (No. 21) issued by Ryan covers the same subject.

If elongated bolt holes are found, modification covered in Parts 1 and 2 (p. 37) should be accomplished. If no hole elongation is, present Part 2 modifi-

• Slash cargo handling time!
• Reduce manpower!
• Cut time on ground!

with sensational new

WESTERN GEAR TUG-BAR



PHOTOS COURTESY OF DOUGLAS AIRCRAFT CO., INC.

When cargo must be handled in cramped quarters and bulky freight moved efficiently and quickly, that's where Tug-Bar excels! One man with a Tug-Bar can move two tons, put it where it's needed without fuss or cuss. Tug-Bar is the ideal answer for fast, efficient one-man freight handling, whether for aircraft, railroad, truck or trailer use. Tug-Bar is flexible, easy to control, operates wherever there is room for a man to stand. Low floor loading with optional load lips available for any loading requirement. Weighs only 110 lbs., available in standard units, 110V AC or 24V DC.

Tug-Bar is manufactured by Western Gear Works, known since 1888 as one of the nation's foremost designers and manufacturers of gears and mechanical equipment for the transmission of motion and torque.

For further details on Tug-Bar and its operation write L. A. Myhre, Executive Offices, Western Gear Works, P.O. Box 182, Lynwood, Calif.

5445

Thos. J. Bannan, President

Since 1888

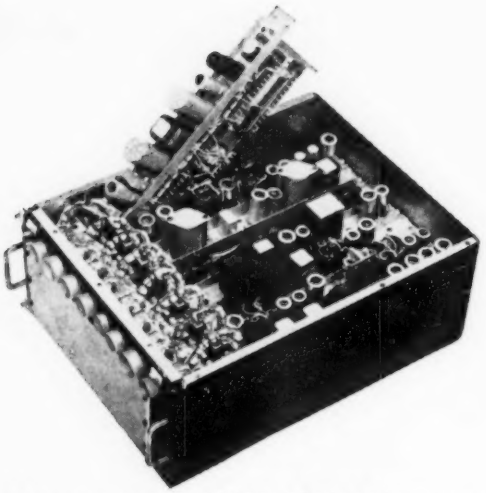
WESTERN GEAR WORKS

PACIFIC-WESTERN PRODUCTS | POWER TRANSMISSION GEARS • MACHINERY

PACIFIC GEAR & TOOL WORKS · SOUTH WESTERN GEAR WORKS

PLANTS AT LYNWOOD, PASADENA, BELMONT, SAN FRANCISCO (CALIF.) SEATTLE AND HOUSTON — REPRESENTATIVES IN PRINCIPAL CITIES

Problem:



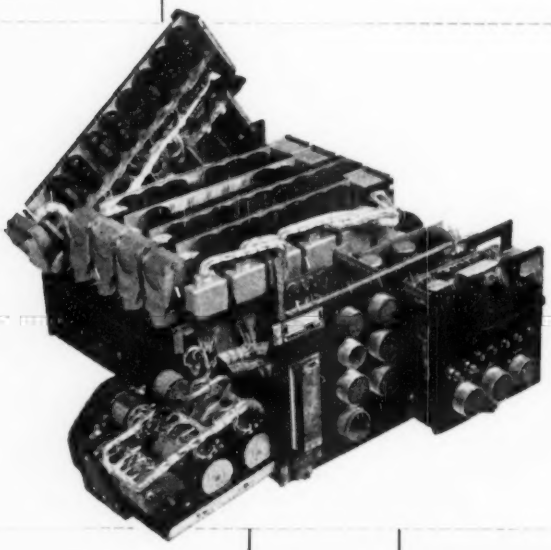
Redesign of an airborne analog computer to perform additional functions called for 20 per cent more parts— with no over-all increase in size, or change in form. At the same time, a high degree of reliability had to be maintained.

APPROACH TO RELIABILITY

Advanced radar fire control systems for military aircraft demand the highest degree of reliability under severe restrictions. These include quantity manufacturability, minimum size and weight, protection from shock and heat, serviceability, and exacting performance.

At Hughes, one objective of equipment design engineers is to maintain consistent essential performance of the systems while steadily improving reliability. Following is an example of accomplishment by Hughes engineers in this specialized area:

Solution:



By use of improved components, unique packaging techniques, and thorough environmental testing, Hughes design engineers were able to meet specifications and improve reliability as well. Result was that the new computer operated at mean internal temperatures in excess of 120°C and withstood shocks of 50 g's— as against 85°C and 30 g's for the original unit.

ENGINEERS experienced in the fields of product design, electronics packaging, miniaturization and component reliability will find outlets for their abilities in new advanced packaging and reliability problems.

Scientific and Engineering Staff

HUGHES

RESEARCH AND DEVELOPMENT LABORATORIES

Culver City, Los Angeles County, California

cations should be made.

• **Part 1.** Check for elongated bolt holes at six locations, two outboard and two inboard forward wing attachment bolts and two aft wing attachment bolts. If elongated holes are evident, the forward wing attachment holes should be reamed to take the next larger size bolts (AN7-10A). Remove and replace only one bolt at a time and torque to 140-in.-lb.

Take out the two AN5-65A aft attachment bolts, tube spacers, washers and units and install two 4½-in.-long .064 24ST alclad doubler strips to each end of the bottom inside flange of frame 142.57. Rivet each strip to the frame with 4/32-in. diameter rivets and drill and ream to .3125 diameter to match the existing ⅝ diameter bolt hole in each frame. The two tube spacers must be shortened to fit within the channel and the two AN5-65A bolts should be installed and torqued to 140 in.-lb.

• **Part 2.** A wing-to-fuselage chordwise shear attachment should be installed by fabricating a .064 24S-T4 Alclad angle conforming to the wing contour and attached to the lower longeron inboard flange on both sides of the plane. This angle should extend from the wing front spar reference plane to approximately one inch aft of the wing center spar reference plane (about 22½ in. long).

Attachment to the upper longeron should be made with eight AN-3 bolts. Attachment to the wing skin should be with 15/32-in. rivets, which may be blind.

In drilling through the wing skin, be careful not to injure the fuel tank. Flange of angle attaching to the wing skin may be cut to conform with existing holes in wing skin for tubing that may pass through this area.

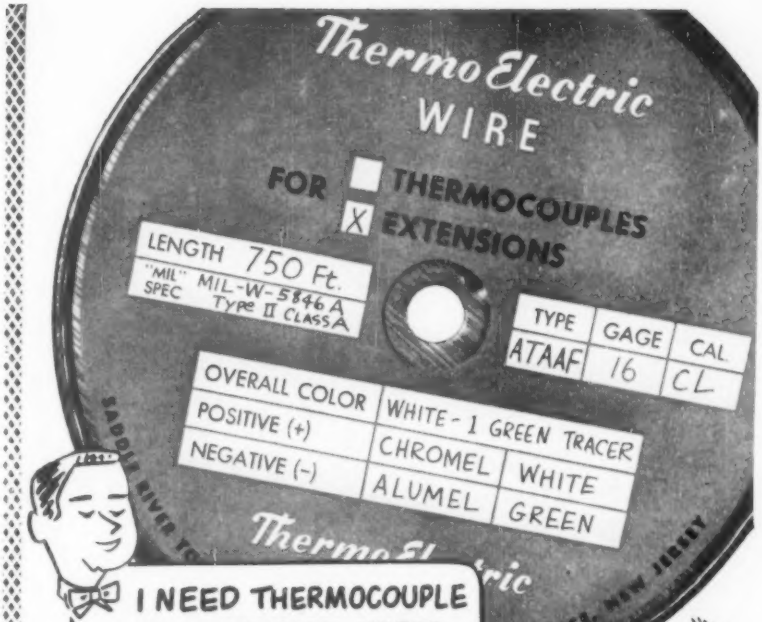
NATA Forms New Air Overhaul Group

An offshoot of National Aviation Trades Assn. has been formed to coordinate the activities of nationwide civilian aircraft maintenance facilities in working with government and military agencies on overhaul contracts.

First meeting of the new group, National Aviation Maintenance Council, has been held in Washington with representatives of industry, Military Air Transport Service, Civil Aeronautics Administration and Army Aviation.

The council will function as an affiliated committee of NATA under the association's vice-president-maintenance. This position currently is held by William Lotzer of Wisconsin.

NAMC plans to hold its second meeting at the National Aviation Trades Assn. annual convention at Miami Beach, Fla., Nov. 9.



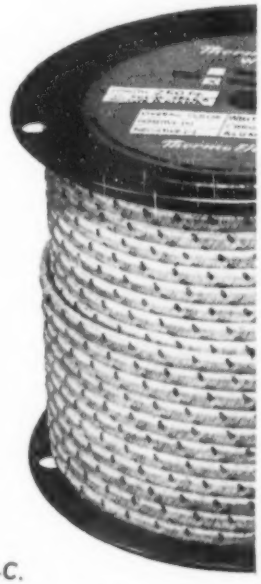
T-E makes all types of "MIL" spec wires. Take your pick from the list below. Most are in stock. If you don't see what you want, let us know. That's our business—making the wires you want.

MIL-W-5845A—Iron Constantan
type I Classes A, B, C, D, E, F, G, H, I, J Gages from 14 to 30
type II Classes A, B, C 8 ohms/100 ft.
type III Classes A, B, C 8 ohms/200 ft.

MIL-W-5846A—Chromel Alumel
type I Classes A, B, C, D, E, Gages from 14 to 26
type II Class A 7 ohms/25 ft.
type III Class A 7 ohms/50 ft.
type IV Class A 7 ohms/100 ft.

MIL-W-5908B—Copper Constantan
type I Classes A, B, C, D, E, F, G Gages from 12 to 20
type II Classes A and B 7 ohms/200 ft.
type III Classes A and B 20-18 gage
type IV Classes A and B 20-16 gage
type V Classes A and B 18-14 gage

Stainless steel overbraid on any "MIL" spec wire, if you wish.



Interested? Write for Bulletin 31-200-C.

Pyrometers • Thermocouples • Protection Tubes • Quick-Coupling Connectors
Thermocouple and Extension Wires • Resistance Bulbs • Connector Panels

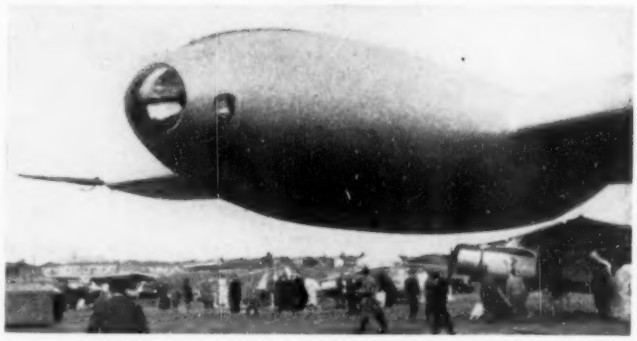
Thermo Electric Co., Inc.
SADDLE RIVER TOWNSHIP, ROCHELLE PARK POST OFFICE, NEW JERSEY
IN CANADA—THERMO ELECTRIC (Canada) Ltd., BRAMPTON, ONTARIO

Camera Reveals SBAC Design Details

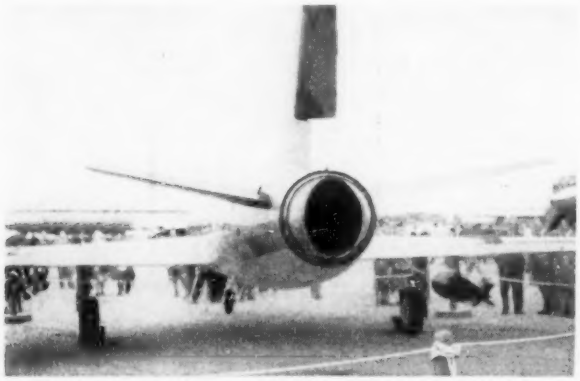
Farnborough is a magic word in the fall. The grass strips alongside the wavy blacktop runways of the Royal Aircraft Establishment are thronged with technicians from the countries of the world, sharing a common interest in the details of airplane design and construction.

For a week, the latest in British military and civilian aircraft is on display, and the technicians—burdened with cameras and notebooks—look and photograph and sketch.

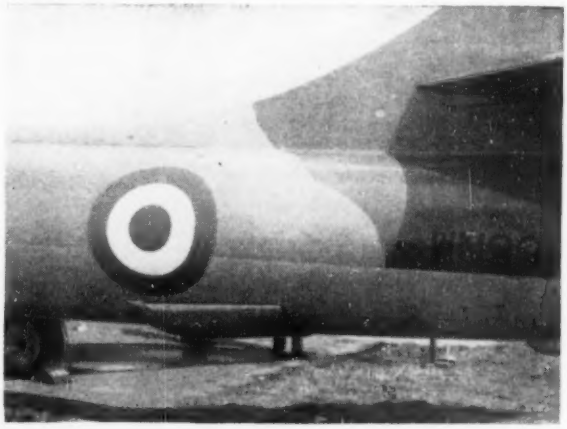
Here are some of the unusual features of British airplanes as seen by Robert Hotz, one of AVIATION WEEK'S observers at this year's SBAC display.



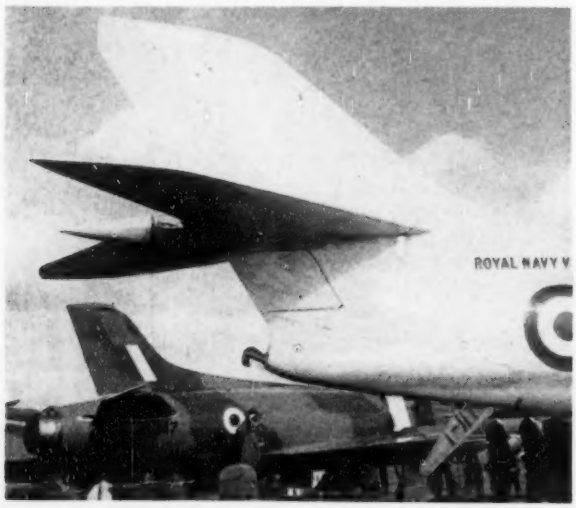
SLIPPER TANK on DH Comet 3 houses landing light and wing-illumination light as well as extra fuel for this trans-Atlantic transport.



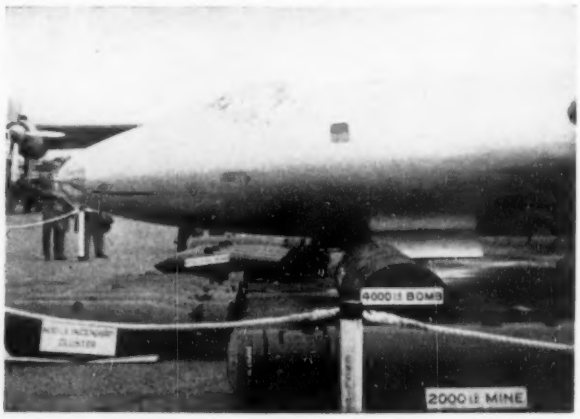
UP THE SPOUT is this view of the Avon afterburner installation in the Vickers' Supermarine Swift fighter. Vertical eyelid nozzle varies the afterburner's exit area for thrust optimizing.



HUNTER HALTER is this new speed brake, hastily engineered as a fix for the sleek Hawker interceptor. Breaking the contour of the handsome lines, this brake is a one-piece unit and is operated by a single hydraulic strut.



SUPER SURFACES on Supermarine 525 twin-Avon Naval fighter show large range of motion of variable-incidence tail. Bullet fairing houses brake chute; lower fuselage fairing covers tail hook. Supermarine Swift tail is in background.

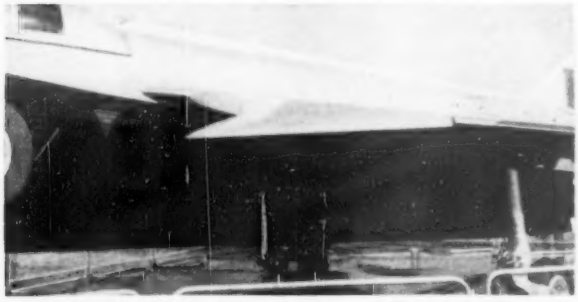


CANBERRA BURDEN is spread out on ground around this standard RAF light bomber. New low-drag shape characterizes 1,000-lb. bombs in row at rear; new high-drag configuration hints that 4,000-lb. bomb in center is atomic weapon.

SOAR-METEOR takes off for flight demonstration of latest Rolls-Royce River-class turbojet, the tiny Soar. Only 16 in. in diameter, the Soar blasts out more than 1,800 lb. thrust; two units on the Meteor flew it during demonstrations with main engines turned off.

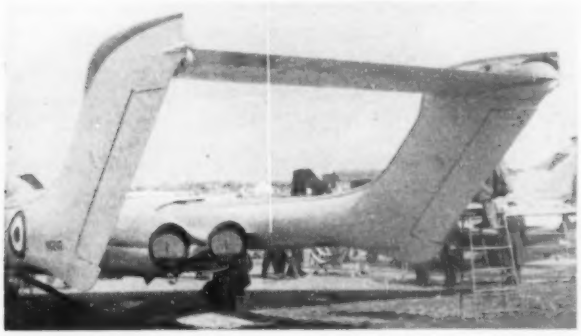
SOAR CLOSEUP shows the uncowled configuration of this turbojet with the highest claimed thrust-weight ratio of current engines. Disk at left of engine covers the exhaust outlet.

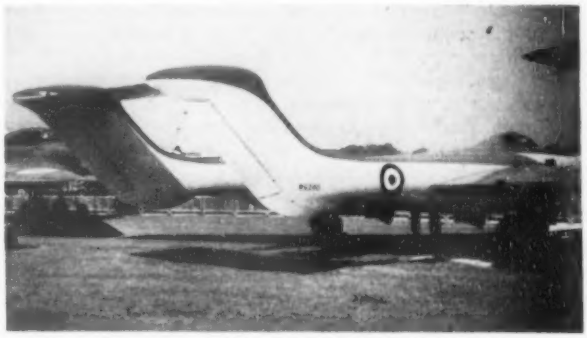
UNGAINLY SEAMEW sports these fixed slats on wings to help control over the slow end of its speed range.



SHORT DROOP is fixed leading-edge extension on the S.B.5 research plane wing. Plane was built to determine lowspeed characteristics of the English Electric P.1 fighter-interceptor. Windtunnel tests showed improved lowspeed flow over swept (69 deg. max.) wing when leading edge near fuselage was drooped.

ROCKETS AWAY out on the span of the Vickers Swift add to the hard-hitting 30-mm. cannon installed as primary battery in this speedy Royal Air Force fighter aircraft.





TALL TAIL of D.H. 110 fighter prototype has been considerably modified to accommodate all-flying tail. Photo at left shows new configuration with large housings for actuators at top of fin, and increased depth of boom near the bottom leading edge. Contrast this picture with the one at the right, taken at the 1953 Farnborough show.

Paper Makes Expendable Rocket Launcher

• Design is inexpensive and easy to produce, can be assembled quickly for use in the field.

Paper is being used as the basic material in the production of a simple, expendable, cluster aircraft rocket launcher (ECARL) developed by Century Engineers, Inc., Burbank, Calif.

The economy-slanted, jettisonable configuration, which accommodates seven rounds of 2.75-in. folding fin aircraft rockets (FFAR), is now in high-volume production.

The Aero 6A type is being built by Century for the Navy. Order is for 120,000. The launcher, which can go on any plane equipped with an Aero 14 pylon, was used on the Douglas AD Skyraider in combat in Korea.

Except for minor modifications, this model of the launcher basically is the same as the Aero X6A model, of which Century initially built 300.

Air Force also has used the ECARL for the North American F-86, Martin B-57 and Republic F-84 for testing and training purposes. About 600 were built for this service.

The launcher design has been extended to larger packages, including a nine-round 2.75-in. unit, a 19-round 2-in. unit, and two larger configurations still under wraps.

► **Requirements**—Problem in the design and construction of the launcher was to create a unit which would:

- **Have high reliability.**
- **Retain the rockets** in the launcher under high values of deceleration, such as encountered in a carrier landing, yet still release the rocket when fired.
- **Fire the rockets** in a ripple pattern of proper sequence and interval.
- **Maintain very tight dispersion.**
- **Be aerodynamically clean,** light, strong, relatively inexpensive.

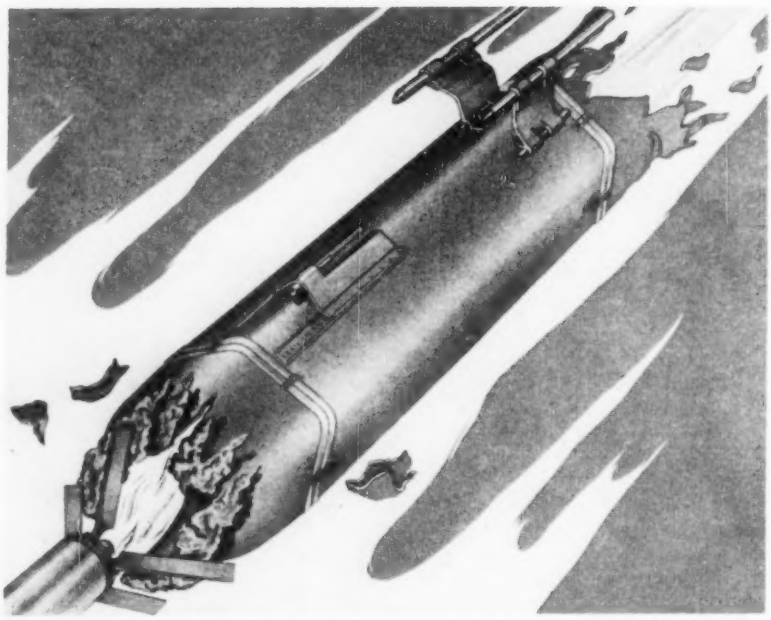
► **Simple Production**—In the launcher manufacturing process, the center section is made up of a cluster of seven paper tubes, with short, wood sticks filleted between the tubes for local reinforcement, and to provide support for detent latches used to retain the rockets.

This dry bundle is then spirally wrapped with a heavy paper casing enclosing an aluminum foil moisture barrier. Detents are then attached to the sticks. The entire assembly is dipped twice in a hot plastic bath. Curing of this reinforcement plastic is practically the only time-consuming factor in the production scheme. Minimum curing in a heated and ventilated room is two hours for the first dip, six hours for the second dip.

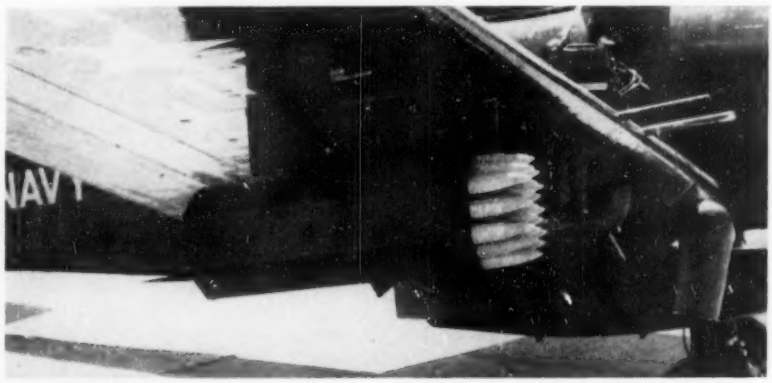
After the plastic has cured, light-gage steel stamped bulkheads are pressed onto the launcher ends to give them additional strength. A spinning operation is used to size the bulkhead holes tightly against the ends of the tubes.

► **Electrical Connection**—An intervalometer, which distributes the firing impulse to the rockets, is attached to the aft bulkhead. The intervalometer is encased in a two-piece plastic case. The "spider" circuit is assembled and inserted in half of the case, the other half is then applied, cemented with a special developed adhesive. The assembly includes a wire and male plug pigtail for completing the circuit to the airplane power supply.

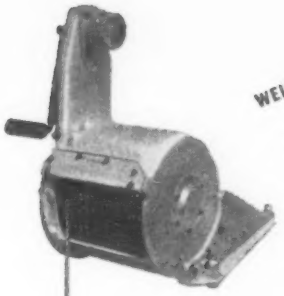
Installation of adjustable hanger brackets and tie rods complete the assembly. The hangers make the launcher adaptable to all Air Force planes equipped with high velocity air-



END FAIRINGS SHATTER as folding fin rocket blasts from expendable launcher. Adjustable hangers atop launcher adapt latter to planes fitted with HVAR posts.



LARGE PACKAGE: 19-round, 2.75-in. launcher (minus fairings) under Skyraider wing.



WEIGHS ONLY 47 LBS.

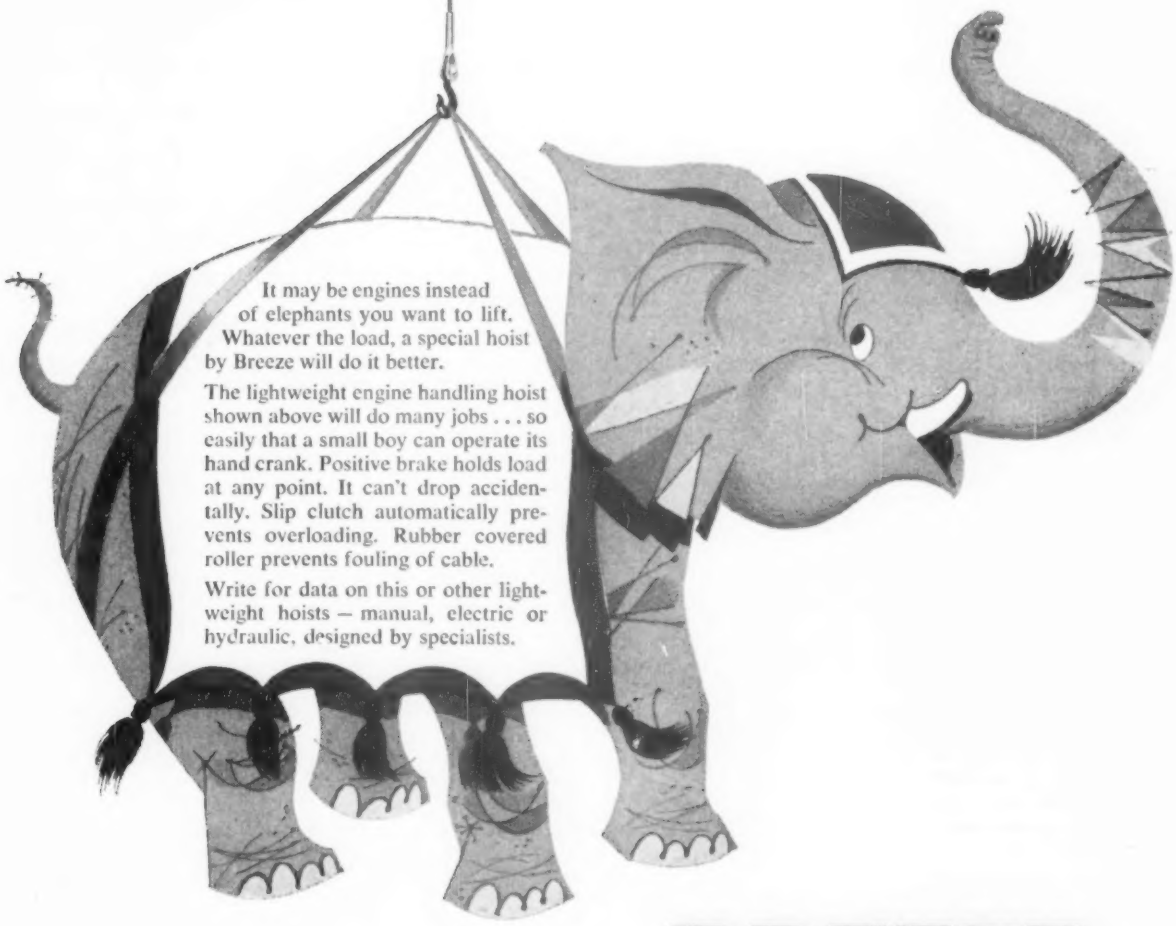
OPERATING LOAD 2350 LBS.

SAFETY FEATURES

CABLE CAN'T FOUL

OVERLOAD PROTECTION

HAND HOIST BY BREEZE LIFTS TONS WITH EASE!



It may be engines instead of elephants you want to lift. Whatever the load, a special hoist by Breeze will do it better.

The lightweight engine handling hoist shown above will do many jobs . . . so easily that a small boy can operate its hand crank. Positive brake holds load at any point. It can't drop accidentally. Slip clutch automatically prevents overloading. Rubber covered roller prevents fouling of cable.

Write for data on this or other lightweight hoists — manual, electric or hydraulic, designed by specialists.

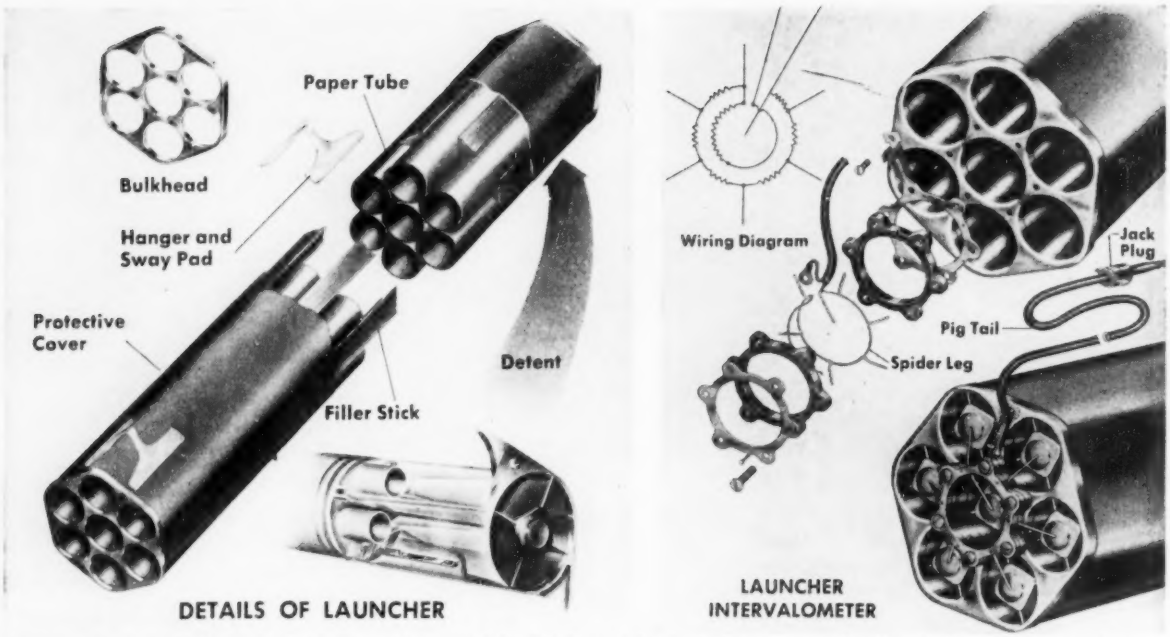
BREEZE MARS

RADIO IGNITION SHIELDING • FLEXIBLE METAL TUBING • ACTUATING SYSTEMS • WELDED DIAPHRAGM BELLOWS • AERO-SEAL HOSE CLAMPS

BREEZE

CORPORATIONS, INC.

700 Liberty Avenue, Union, N. J.



CURED PAPER-PLASTIC launcher details are shown at left; sketch at right shows two-part case housing the launcher's intervalometer.

craft rocket (HVAR) posts.

▶ **Shipment, Fairings**—Enough strength has been achieved in the construction of the launcher so that it doubles as a shipping container. Rocket motors are installed in the launcher, the ends of the launcher capped with easily removable lids and the unit can be shipped "as is," without other protective enclosures.

Warheads for rockets and frangible streamlined fairings for the forward and aft ends of the launcher are shipped in separate containers, for installation in the field.

The fairings, like the launcher tubes, also are a paper-and-plastic combination readily shatterable from rocket impact and blast. A metal band at the base of each fairing has attach clips which slip over the launcher bulkhead to hold the fairings in place.

Length of the launcher without fairings is 40.07 in.; with fairings 72.07 in. Diameter is 9¼ in. Capacity is seven rounds, weight loaded is 131.39 lb., and weight after firing is 24 lb.

▶ **Development Data**—Initially, seven companies were asked to participate in the launcher preliminary design studies for the Navy, but the investigation finally was conducted by Century alone. Experiments were conducted with a number of launchers composed of various metals, plastics or combinations of materials. Each approach had some merits, but none of the materials was completely satisfactory. Cost was a constant consideration, and this factor finally led to the idea of using paper.

Century engineers obtained permission from officials at the Naval Ordnance Test Station, Inyokern, to fire a rocket on its test range, using an ordinary paper tube—the kind employed to mail bulky papers in a roll.

It was expected that the blast would tear the forward end of the tube after the rocket had left the tube, but this was no great source of concern. The important thing was whether the aft end of the tube would hold up under the initial igniter blast. If it did, it was felt that the paper tube could be developed into a successful launcher.

In the ensuing study, the test station's Dr. N. E. Ward and Dr. W. B. McLain gave valuable aid.

MOTORS are shipped in launcher; other containers hold warheads, fairings.

▶ **First Trial Firing**—To protect personnel and equipment, the tube was tied down by U-bolts during the test. When the rocket was fired, the aft end of the tube held up surprisingly well. The forward end was frayed by the blast, but by that time the rocket had been launched.

The firing was considered successful. Naval officials agreed that the idea could be made to work.

First step was to beef up the tube so that it could withstand the starting impact without disintegrating. The hot-plastic dip and subsequent curing gave ample reinforcement. A number of test firings showed the reinforcement to be sound.

▶ **Spring, Intervalometer**—A simple one-piece spring was developed for the detention of the rocket in the launcher under high deceleration, but for easy release upon firing.

The intervalometer was another headache. It evolved as a single-wire resistance circuit, the amount of resistance controlling the interval between rockets—a rate of 100 per sec.

In the development of the launcher front and aft fairings, the material had to be weak enough to disintegrate, when the first rocket was fired, without damage to the rocket fins.

Basic approach was to start with a papier mache and plastic combination. Then the proportions were varied in test models until the proper strength was achieved.

Development details and some of the construction data on FCARL were supplied to AVIATION WEEK by Carlo Re, Century's chief engineer.

—Irving Stone

NOW

IRC *encapsulated* precision resistors

The presence of extreme climatic conditions, unusual ambient temperatures or salt water are offset by a new IRC encapsulating technique. This IRC development uses an epoxy resin compound for both the winding form and the seal. A special molding process avoids air pockets and assures even, complete distribution of the resin. Designed to operate at 125° C. and to meet the military requirements of salt water immersion, these units exceed MIL-R-93A specifications in 1%, 0.5%, 0.25% and 0.1% tolerances.

Type WW15M—MIL-R-93A Style RB15

Type WW16M—MIL-R-93A Style RB16

Type WW17M—MIL-R-93A Style RB17

Type WW18M—MIL-R-93A Style RB18

Type WW19M—MIL-R-93A Style RB19

Also available for MIL Applications . . .

IRC TYPE WWJ Precision Wire Wounds

In 6 MIL-R-93A styles, plus miniature type WW10J IRC Precision Wire Wound Resistors offer full coverage of requirements for exacting accuracy in critical applications. IRC's superior winding skill and care is the result of over 25 years experience.

SEND COUPON FOR DATA BULLETIN

Voltmeter Multipliers • Boron & Deposited Carbon Precistors • Insulated Composition Resistors • Power Resistors • Controls and Potentiometers • Low Wattage Wire Wounds • Germanium Diodes

Wherever the Circuit Says

Precision Wire Wounds • Ultra HF and Hi-Voltage Resistors • Low Value Capacitors • Selenium Rectifiers • Insulated Chokes • Hermetic Sealing Terminals

IRC

INTERNATIONAL RESISTANCE CO.

Dept. F, 401 N. Broad Street, Philadelphia 8, Pa.

In Canada: *International Resistance Co., Ltd., Toronto, Licensee*

Send Technical Bulletin ☐ D-3 Encapsulated Precisions

☐ D-1 Type WWJ Precisions

Name_____

Title_____

Company_____

Address_____

City_____ State_____

New **HARTWELL**
Aerodynamically-Flush

CHANNEL LATCH...

Trigger-Action mechanism fabricated from two aluminum alloy extrusions

Specially designed for a variety of applications in modern aircraft of all types.

* *Flush*
* *Rugged*
* *Positive Action*
* *Easy to Operate*
* *Lightweight*
* *Simple to Install*

Latch trigger and bolt are fabricated from 24 ST aluminum extrusions which provide very small radius of exposed edges not possible with use of punch press parts.

Bracket is made of standard 302 stainless steel sheet stock and actuating springs of music wire cadmium plated for rust resistance.

Installation cut-out is made in the form of a simple rectangular slot and mounting the latch is accomplished by fastening bracket with six rivets to door structure.

HARTWELL
AVIATION SUPPLY COMPANY

Manufacturers of Aircraft Flush Latches and Hinges, Fittings and Cable Terminals.

9035 Venice Boulevard, Los Angeles 34, Calif.
Branch Office: Wichita, Kansas

USAF Contracts

Following is a list of recent USAF contracts announced by Air Materiel Command.

Fairchild Camera and Instrument Corp., Robbins Lane, Syosset, L. I., N. Y., lens cone assy., spare parts and data, $580,813.

Fenn Mfg. Corp., Hartford, Conn. facilities for production of helicopter rotor heads $361,000.

C. P. Goerz, American Optical Co., 317 E. 24th St., New York 16, lens, 795 ea., $414,-513.

International Business Machines Corp., Poughkeepsie, N. Y., facilities for production of combat information centrals, $5,000,-000.

Kearfott Co., Inc., 1150 McBride Ave., Little Falls, N. J., special tooling, $277,898.

Link Aviation, Inc., Binghamton, N. Y., trainer, instrument, flying, jet-propelled aircraft, 15 ea., $928,896.

Lockheed Aircraft Corp., Burbank, Calif., facilities for the production of aircraft, $1,100,000.

Lycoming Division, Avco Mfg. Corp., 550 Main St., Stratford, Conn., engines, 159 ea., spare parts, $5,333,950; spare parts for aircraft engines, $519,810.

Reynolds Metals Co., Louisville, Ky., chaff, 20,558 cartons, 10,213 cartons, $1,-740,284.

Richmond Machining Div., Willys Motors, Inc., Richmond, Calif., facilities for the production of components and sub-assys., $2,300,000.

Roberts Numbering Machine Co., 700 Jamaica Ave., Brooklyn, N. Y., titler, aerial roll film, 54 ea., $31,930.

Ryan Industries, Inc., 19159 John R St., Detroit 3, control, 1,239 ea., intervalometer, 3,349 ea., $1,145,163.

Sikorsky Aviation Div., United Aircraft Corp., Bridgeport, Conn., facilities for production of helicopters, $6,812,127.

S. Morgan Smith Co., York, Pa., air side pressure control valve and valve positioning system for AEDC, $851,000.

Standard Rolling Mills, Inc., 196 Diamond St., Brooklyn, N. Y., chaff, 18,000 cartons, 15,000 cartons, $1,870,770.

Telectro Industries Corp. 35-16 37th St., Long Island City, N. Y., dryer, 73 ea., handbooks, spare parts, $74,155.

United States Gauge Div., American Machine and Metals, Inc., Sellersville, Pa., pressure indicator, 247 ea., torque pressure, 273 ea., transmitter pressure indicator, 136 ea., $193,716; multi-purpose indicators, 4,538 ea., fuel pressure indicators, 1,191 ea., oil transmitters, 669 ea., $318,499.

C. Frederick Wolfe, Inc., 75-02 88th St., Glendale, L. I., N. Y., transfer car for windtunnel, $133,361.

General Electric Co., X-Ray Dept., 4855 Electric Ave., Milwaukee, body, cone, comp. of camera set, $901,499.

Zenith Optical Div., Polan Industries, Inc., 220 Eighth St., Huntington, W. Va., lens, 535 ea., ray training facilities, $248,924.

The following contract awards were recently announced by Gentile Air Force Depot, Dayton:

Akeley Camera and Instrument Corp., 175 Varick St., New York, N. Y., analyzer, computer appl. A-1B computing gun sight, Sperry, 75 ea., $38,371.

Bendix Aviation Corp., E. Joppa Rd., Towson Rd., Towson 4, Md., capacitors, 750 ea., $29,666.

Bomac Laboratories Inc., Salem Rd., Beverly, Mass., tube, electron, 1,500 ea., $33,750.

Bone Engineering Corp., 701 West Broadway, Glendale 4, Calif., tester, fuel flowmeter, field type, $384,013.

Bruno-New York Industries Corp., 460 W. 34th St., New York 1, N. Y., bridge summation, maintenance spare parts, 103 ea., $102,971.

Cannon Electric Co., 3209 Humboldt St., Los Angeles 31, Calif., connector plugs, 5,056 ea., connector receptacles, 129 ea., $45,409.

Coil Winders, Inc., New York Ave., Westbury, L. I., N. Y., coil winders, 8,630 ea., $44,303.

Cosmos Industries, Inc., 31-28 Queens Blvd., Long Island City, N. Y., signal generator, 239 ea., $228,509.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., transmitter, Magnesyn test, 34 ea., stand, driftmeter collimator test, 12 ea., stand, heeling applicable to F-1 and F-2 autopilot, 7 ea., stand, static balance, 3 ea., $228,849.

GEC Instruments, Inc., 300 North Sierra Madre Villa, Pasadena 15, Calif., oscillograph, recording, 18 trace capacity, 5 ea., $26,430.

General Electric Co., Syracuse, N.Y., tube, electron, cathode ray, 5,400 ea., $72,900.

General Motors Corp., AC Spark Plug Div., Flint, Mich., oscilloscope tachometer, 93 ea., repeater data indicator, 93 ea., $497,702.

Pacific Airmotive Corp., 2940 North Hollywood Way, Burbank, Calif., tester fabric burst strength, 347 ea., $110,179; test stand, diluter, demand oxygen regulator, flowmeter type, 56 ea., $48,317.

South Bend Current Controller Co., Inc., South Bend, Ind., relay switch, electromagnetic, 300 ea., $43,128.

Sperry Gyroscope Co., Sperry Corp., Great Neck, N. Y., mockup, Zero Reader system, 18 ea., fixture, holding amplifier, balance and output measuring and testing, 8 ea., $64,105.

Taffet Radio and Television Co., 2530 Belmont Ave., Bronx 58, N. Y., radio test sets, 327 ea., $79,485.

Tektronix Inc., P.O. Box 831, Portland 7, Ore., oscilloscope, 16 ea., $26,218.

Telectro Industries Corp., 35-16 37th St., L. I. City, N. Y., test set, servo, 490 ea., $96,904.

Wm. R. Whittaker Co., Ltd., 915 North Citrus Ave., Los Angeles 38, Calif., motor, actuator, 142 ea., $28,588.

The following contract awards were recently announced by Middletown Air Materiel Area, Middletown, Pa.:

Alamo Mfg. Co., Inc., 1407 Broadway, New York 18, parachute, cargo, 5,430 ea., $2,826,695.

Blue Anchor Overall Co., Inc., 1826 E. Somerset Street, Philadelphia 34, container, cargo, aerial delivery, 4,221 ea., $152,694.

Joseph D. Doherty Co., Atlantic Parachute, 750 Suffolk St., Lowell, Mass., parachute, cargo, 5,430 ea., $2,826,695.

Irving Air Chute Co., Inc., 1315 Versailles Rd., Lexington, Ky., parachute, cargo, 5,430 ea., $2,826,695.

Jayval Mfg. Co., 301 California Bldg., Denver 2, parachute, cargo, 5,430 ea., $2,826,695.

Mills Mfg. Corp., P. O. Box 8145, Asheville, N. C., parachute, cargo, 5,430 ea., $2,836,695.

Pioneer Parachute Co., Inc., 168 Forest St., Manchester, Conn., parachute, cargo, 5,430 ea., $2,826,695.

Reliance Mfg. Co., 350 Fifth Ave., New York 1, parachute, cargo, 5,430 ea., $2,-826,695.

Springfield Tent and Awning Co., 339 W. Clark, Springfield, Ohio, container, cargo, aerial delivery, 4,222 ea., $152,730.

M. Steinthal and Co., Inc., 222 Fourth Ave, New York 3, parachute, cargo, 5,430 ea., $2,826,695.

Navy Contracts

Contracts recently announced by the Navy's Aviation Supply Office, 700 Robbins Ave., Philadelphia 11, are:

Titeflex, Inc., 500 Frelinghuysen Avenue, Newark 5, N. J., primary lead assy., 4,610 ea., $108,796.

Vinson Mfg. Co., Inc., Van Nuys, Calif., hydraulic relief valve., 37 ea., $26,238.

Albert Mfg. Corp., 524 W. 43rd Street, New York 36, N. Y., transformers and reactors $52,704.

Aviators Clothing Co., Inc., 143 Main St., Beacon, N. Y., insulation liner for MK-4

TIMKEN® wheel bearings stand up every time this 92½-ton airplane lands

ONLY the very best parts and material went into this new B-47 jet bomber. Nothing else could stand the strains of high-speed flight and landing. Most landings of the 92½-ton Stratojet are light as a feather but occasionally even the most proficient pilot sets one of the sleek airplanes down with a wallop! Why aren't there breakdowns? Because B. F. Goodrich Company engineers mounted the wheels on Timken® tapered roller bearings.

One reason Timken bearings can take shock loads like this is because their rollers and races are case-hardened. This process gives Timken bearings hard, wear-resistant surfaces over tough, shock-resistant cores. Another reason is that Timken bearings have full line contact between rollers and races resulting in load-carrying capacity to spare.

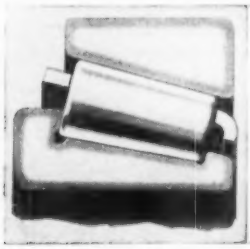
Even landing in a high cross-wind, Timken bearings can handle the tough thrust load imposed on the wheels with ease. Their tapered design enables them to take thrust loads, radial loads or *any combination* of the two.

Wear isn't a problem because Timken bearings practically eliminate friction. They can do this because they're designed to roll so true; and because they're made with microscopic accuracy to conform to their design. And you're doubly assured of Timken bearings' quality because we make our own steel. No other U. S. bearing manufacturer does.

To get these advantages in the equipment you build or buy, always look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

How the **B. F. GOODRICH COMPANY, AERONAUTICAL DIVISION,** mounts the landing wheels of the B-47 on Timken bearings to assure long life, minimum maintenance and trouble-free performance under heavy shock loads.



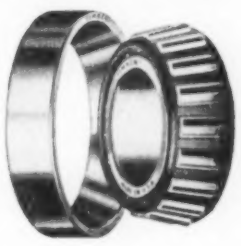
HARD ON THE OUTSIDE, TOUGH ON THE INSIDE

Rollers and races of Timken bearings are case-carburized to give a hard, wear-resisting surface and a tough, shock-resisting core. Result: longer bearing life.

The Timken Company leads in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis Timken steels.

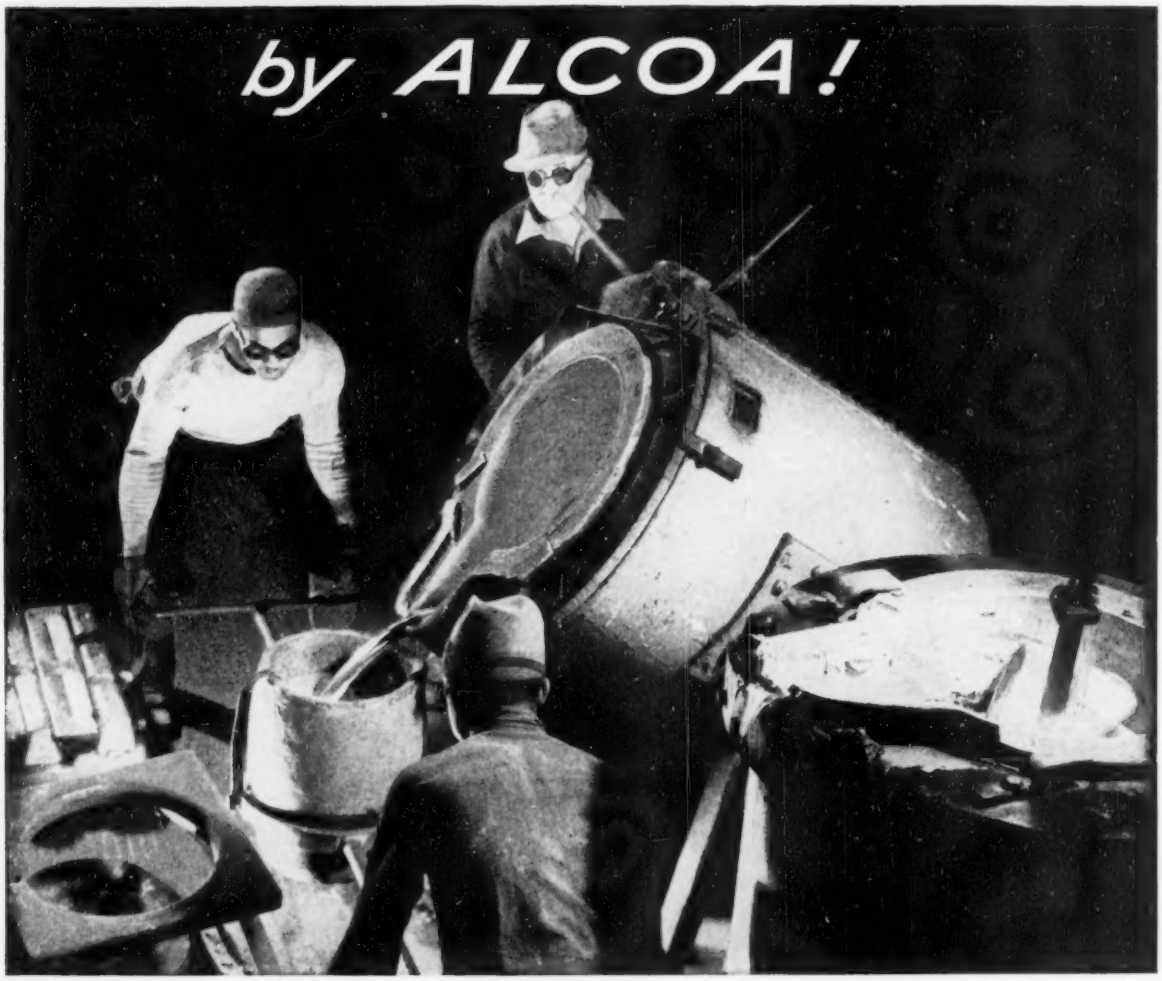
TIMKEN

TAPERED ROLLER BEARINGS



NOT JUST A BALL — NOT JUST A ROLLER — THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST — LOADS OR ANY COMBINATION

CASTINGS



Over one-fourth of all the aluminum produced winds up in cast form. In an effort to fulfil the tremendous demand for products made from this process, Alcoa operates five modern casting plants. In Vernon, California and Bridgeport, Connecticut and Cleveland, Detroit and Buffalo, Alcoa makes castings of every type — sand, die, permanent mold, and plaster — both in aluminum and in magnesium.

If casting rejection is a problem in your plant, then you should know of Alcoa's recent advances in casting processes. We make sand castings with walls $\frac{1}{8}''$ thin, and we hold tolerances to $\frac{1}{32}''$. The permanent-mold process, once limited to small parts, now includes 800-lb bearings and 250-lb pistons. Our plaster castings now compete price-wise with die castings and are held to within $\pm 0.005''$. Our plants are producing die castings as strong as, and in finished form, less expensive than, equivalent parts in cast iron.

Chances are you haven't taken the time lately to find out exactly what your castings cost you. We don't mean the foundry price — we mean the price as finished and assembled. As a part of the Alcoa team which has helped many other companies slash the number of casting rejects, we offer this suggestion. Scrapped casting costs are worth a look-see in your plant, and the man to help you do this is your Alcoa sales engineer. ALUMINUM COMPANY OF AMERICA, 1800-K Alcoa Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

and anti-exposure suit, 5,841 ea., $127,881.

Bendix Products Div., Bendix Aviation Corp., 401 Bendix Drive, South Bend 20, Ind., items of fuel control parts for aircraft engines, $43,168; shaft and valve assy., $75,662.

Boonton Radio Corp., Intervale Road, Boonton, N. J., univerter and spare parts, 101 ea., $47,137.

Boston Insulated Wire and Cable Co., Boston, Mass., wire, $30,207.

Carolina Paint and Varnish Works, 1025 Howard St., Greensboro, N. C., enamel, 42,389 qts., $25,911.

Dittmore and Freimuth Co., 2517 E. Norwich St., Cudahy, Wis., adapter, 5,000 ea., $84,300.

J. A. Dubow Sporting Goods Corp., 1907 Milwaukee Ave., Chicago, aviator's jackets, 1,430 ea., $25,726.

Eclipse-Pioneer Division, Bendix Aviation Corp., Teterboro, N. J., maintenance parts for oxygen regulators and indicators, $48,080; gage assy., wrench, $25,944.

Engineering and Research Corp., P. O. Box 209, Hyattsville, Md., power supply, gear box assy., $25,350; basic motor, summing and magnetic clutch, $62,206.

L. W. Foster Sportswear Co., Inc., Hancock and Westmoreland Sts., Philadelphia 40, leggings and vests, $44,150.

Grumman Aircraft Eng. Corp., Bethpage, L. I., N. Y., vandyke and blueprint revisions, $25,920.

Hood Rubber Co. Div. of the B. F. Goodrich Co., 36 Nichols Ave., Watertown, Mass., flying boots, 3,000 ea., $28,620.

Hub Paint and Varnish Co. Inc., 47-38 Fifth St., Long Island City 1, N. Y., enamel and paint, $28,966.

Industrial Television Inc., 369 Lexington Ave., Clifton, N. J., oscilloscope and spare parts for same, MIPR, 65 ea., and spares, $91,354.

Lavoie Laboratories, Inc., Matawan, Freehold Road, Morganville, N. J., oscilloscope, 127 ea., $248,726.

Leland Electric Co. Div. of American Machine and Foundry Co., 1501 Webster St., Dayton 1, Ohio, inverter, 180 ea., $70,945.

Marcon Mfg. Co., 141 River Rd., Nutley 10, N. J., test bench harness assy.; spare parts instruction sheets, 45 ea., $31,781.

McDonnell Aircraft Corp., St. Louis 3, reservoir assy., 364 ea., $40,038.

Niles Bement Pond Co., Chandler Evans Div., 1 Charter Oak Blvd., West Hartford, Conn., maintenance parts for carburetors, $50,331 and $196,344.

Pantex Mfg. Corp., 521 Roosevelt Ave., Pawtucket, R. I., hydraulic valve assy., 174 ea., $25,892.

Patten Co., Inc., 142 Green St., Worcester 8, Mass., pneumatic raft 3,040 ea., $98,040.

BuAer Contracts

The following contract awards of $25,000 and more have been announced recently by the Bureau of Aeronautics, Department of the Navy, Washington 25, D. C.

E. W. Bliss Co., Canton, Ohio, Scientific and technical professional services, $295,-123.

Convair Division of General Dynamics Corp., San Diego, California, Design data and tests for R4Y-1 airplanes, spare parts, 36 ea., $26,190.

Allen B. DuMont Laboratories, Inc., Clifton, N. J., Calibrators and spare parts, 250 ea., $52,604.

Elgeet Optical Co., Inc., Rochester, N. Y., Photographic lens, 67 ea., $82,611.

General Electric Co., Schenectady, N. Y., Aircraft engine starter generators, 103 ea., $63,758.

Independent Engineering Co., Inc., O'Fallon, Ill., Compressed gas tank semi-trailers, 27 ea., $246,600.

Solar Aircraft Co., Des Moines, Iowa, Installation of machine tools for production of engine and propeller parts, $429,329.

Texas Instrument, Inc., Dallas, Texas, Drift height indicators and spare parts, 325 ea., $100,977.

and NEVER BEFORE has the A. W. HAYDON COMPANY *been so proud of its contribution...*

In the never-ending conquest of the vast barriers of space and time, Douglas goes ever forward meeting every challenge that men and machines must face. The newest — and brightest — star in the aviation firmament, the Douglas DC-7, is truly a miracle of the mastery of men over machines . . . and in this great work sixteen A. W. Haydon timing devices play an important part.

We at A. W. Haydon take pride in our contribution toward bringing a mass of metal and machinery into integrated performance which meets Douglas' high standards. Integrated performance is born of a multitude of small component parts, working in perfect mechanical and electrical coordination. The A. W. Haydon precision timing instruments are a vital part of this vast network.

DOUGLAS

DOUGLAS DC-7, the ultimate in comfortable and safe air travel. Swift, luxurious, dependable — the new DOUGLAS DC-7 justly deserves the accolades it is receiving.

- ✓ A. W. Haydon Time Delay Relay is a very important component of the automatic prop feathering system.
- ✓ A. W. Haydon Time Delay Relay times duration of prop feathering.
- ✓ A. W. Haydon Repeat Cycle Timer is a vital part of the prop deicing equipment.
- ✓ A. W. Haydon D.C. Timing Motors are used in the cabin pressurization systems.

when a timing poses a problem — consult

(Catalog sent on request)

The A. W. HAYDON COMPANY
227 NORTH ELM STREET
WATERBURY 20, CONNECTICUT

Design and Manufacture of Electro-Mechanical Timing Devices

A Look at Ramo-Wooldridge

New Avionics Team Makes Fast Start

By Philip Klass

Los Angeles—The rapid growth in both size and stature of the Ramo-Wooldridge Corp. during its first year of existence, reminiscent of the growth of Hughes Aircraft Co. six years ago, has set industry observers to wondering whether another avionics giant is in the making. There is good cause for such speculation.

The new company is headed by Dr. Dean Wooldridge (president) and Dr. Simon Ramo (executive vice-president), former top scientists and vice presidents at Hughes. The two are generally credited with assembling for HAC one of the nation's largest and ablest scientific staffs, a big factor in that company's meteoric rise (AVIATION WEEK May 25, 1953, p. 14). Financial backing for the new firm comes from Thompson Products, a well-established aviation and automotive company.

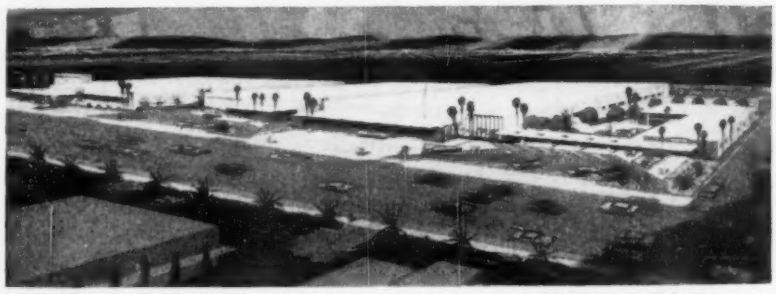
▶**Other Causes to Wonder**—In less than a year, the new company's staff has grown from four to 150 and is expected to top 250 by the end of the year. In this period, R-W has built up a $9-million backlog, a large chunk of it for an advanced missile program sponsored by the USAF. R-W is also active in radar, fire control, computers, data handling devices, and advanced communications, the same pillars upon which HAC was built.

Within a year, R-W expects to be producing semiconductor devices through a wholly owned subsidiary, Pacific Semiconductors, Inc., which will develop, manufacture and market diodes, transistors, and similar devices. The new subsidiary is headed by Dr. Harper Q. North under whose direction Hughes firmly established itself in the semiconductor business.

R-W's roster of professional scientists, currently numbering around 75, includes such prominent names as Dr. Ralph P. Johnson and Dr. Louis Dunn. Until recently, Johnson was director of research and development at Hughes, while Dunn was head of Cal Tech's Jet Propulsion Lab, which developed the Corporal missile.

▶**Emphasis on Systems Engineering**—Systems engineering and the development of products with a high scientific content primarily in the electronics field are the cornerstones upon which R-W expects to build.

TODAY—This is headquarters of Ramo-Wooldridge, but plans are ready for . . .



TOMORROW—Artist's drawing shows how company's expanded facilities will look.

"Superior competence in electronic systems analysis, engineering, and development is now and will continue to be one of the most salable articles on the American industrial scene," Wooldridge believes. He expects the company to maintain a reputation for competence in this field, for both military and business-industrial problems.

R-W intends to manufacture products and systems coming out of its R & D efforts, contrary to early industry scuttlebutt that the company was solely in research and development.

▶**Quality, Not Quantity**—This sounds like an ambitious undertaking for a company whose present scientific staff numbers under a hundred. However, Wooldridge points out that R-W's scientific staff is larger than HAC's was six years ago when it began the missile and fire control developments which later established Hughes as top dog in the avionics field. For systems engineering work, Wooldridge believes that a small nucleus of highly competent scientists is more important than astronomical numbers.

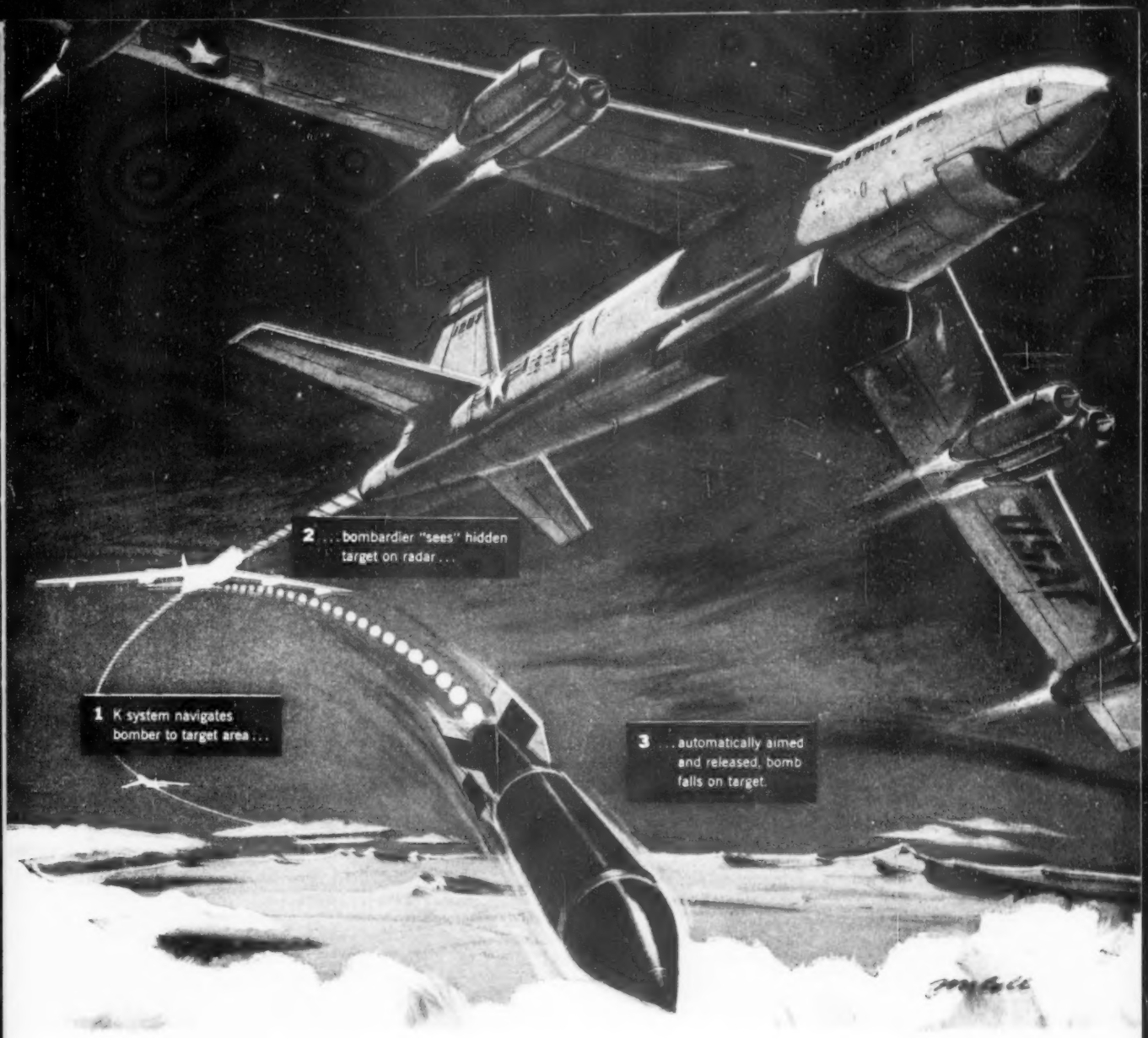
Wooldridge expects the company's staff to top 500 by the end of 1955, with a ratio of professional scientists to total staff of about 1:3. Asked to hazard a guess on company size in five years, Wooldridge picked a figure of 2,000.

These figures indicate that R-W does

West Coast Report

A year ago this month, Hughes Aircraft Co.'s top management, which had built the company from a struggling experimental aircraft shop into the country's top avionics producer, walked out in protest against the owner's policies. In the intervening year, two new companies, the Ramo-Wooldridge Corp. and Litton Industries, have been formed by these former HAC people. Both have quickly established themselves in the avionics and electronics field, but through slightly different approaches.

Philip Klass, Aviation Week's Avionics Editor, studied these two companies during his recent extended stay on the West Coast. In this article, he reports on Ramo-Wooldridge's growth during the last year, and its philosophies, plans and ambitions for the future. The next article will deal with Litton Industries.


2 . . . bombardier "sees" hidden target on radar . . .
1 K system navigates bomber to target area . . .
3 . . . automatically aimed and released, bomb falls on target.

USAF DESTROYS UNSEEN TARGETS; PLANES USE RADAR BOMBSIGHT

THE STORY BEHIND THE STORY:

■ You've read headlines like the one above, reporting the precision of Air Force bombing—during tests. Within hours after an aggressor attack, you would read them again—reporting deadly counteraction. Night or day, regardless of weather, America can carry out its policy of instant retaliation to any aggressor—in any part of the world.

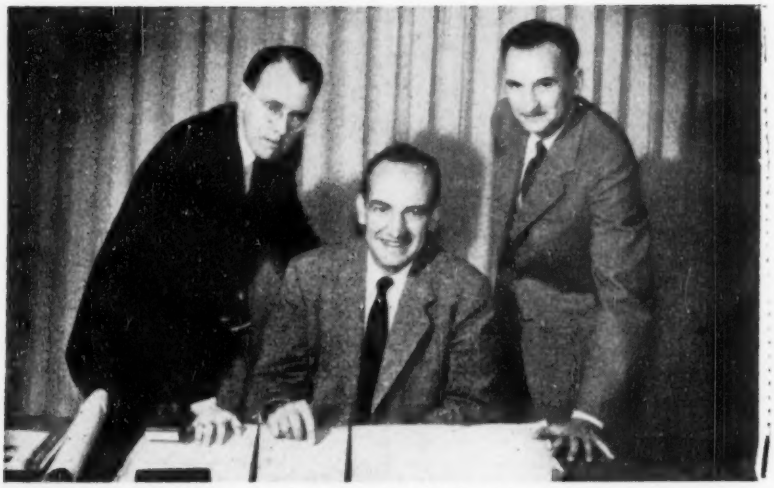
■ Now in large-scale production, the Air Force K Bombing System combines automatic navigation with all-weather identification and bombing of any target. With the aid of the Sperry Gyropilot* Flight Control and the K System, the crew flies the high-speed bomber to the target area. Using the Sperry-designed Bombing Navigational Computer, the bombardier locates the target optically, or if hidden, by radar. The effects of speed, altitude and wind on the falling bomb are automatically computed, enabling the bombardier to score direct hits. In simplifying the complex job of bombing at extreme altitude from high speed jets, the K System permits more time and flexibility on the bomb run . . . more certainty of "mission completed."

■ There's little resemblance between this automatic "brain" and the first bombsight developed by Sperry for use in World War I—a simple telescope and range scale no larger than an egg beater. But both were made possible because a military-industry team anticipated the needs of modern defense—then met those needs with a strategic bombing program which authorities credit with helping to prevent a new global war.

*T.M. REG. U.S. PAT. OFF.

SPERRY GYROSCOPE COMPANY

DIVISION OF THE SPERRY CORPORATION • GREAT NECK, N. Y.



DOCTORS IN THE HOUSE—President Dean Wooldridge (l.), executive v.p. Simon Ramo (r.), and Harper Q. North, head of subsidiary, Pacific Semiconductors, pose for picture.

not plan an operation as large as HAC. However, it is doubtful whether Ramo or Wooldridge six years ago foresaw the size to which Hughes would eventually grow.

▶**Factors Affecting Growth**—In some areas, the factors which may determine R-W growth appear more favorable than those which HAC faced six years ago. In 1948, HAC was a nearly defunct aircraft manufacturer with no experience or reputation in the avionics field. This made it difficult to get important military contracts and to attract top scientific personnel. In marked contrast, R-W starts out with an excellent reputation, both in government and scientific circles.

On the other hand, HAC assembled its staff in the early postwar years when there was a general restlessness among scientists and engineers, who had been unable to change jobs during the war. Many wanted to move to California, but there were relatively few avionics and electronics firms here at the time. Military electronics business was at an extremely low level.

Although Wooldridge belittles the effect of HAC's salary policy in attracting scientists, saying it was not out of line with the rest of industry, he admits that Hughes acquired the reputation of paying well to get needed specialists.

Today all of these conditions have changed. Competition for engineers and scientists is keen everywhere, particularly in Southern California. Despite these adverse factors, however, R-W does not appear to be having any trouble attracting top-notch personnel, for reasons which will be described later.

▶**More Competition, But . . .**—When HAC entered the missile and intercept or fire control fields, both were in their infancy, a vitally important factor in the company's growth. Today, these fields are crowded with competition. However, Wooldridge believes that there are "areas which offer as bright a future today," and where R-W can carve its niche.

One such area, which R-W expects to become a major activity, is guided missile systems. The importance which the company attaches to its multi-million-dollar missile program is pointed up by the fact that Ramo will head the recently formed guided missiles research division, in addition to his other corporate duties. Also, that R-W was able to coax Dr. Dunn away from JPL to be associate director of the new division.

Within the past several weeks, R-W has announced two more additions to its missile division: Dr. M. U. Clauser, former head of Purdue University's school of aeronautics, as director of aeronautics and structures, and Dr. J. C. Fletcher, former head of theory and analysis on HAC's Falcon missile, as director of guidance and control.

▶**Other Promising Areas**—Another area with a bright future is advanced communications, Wooldridge believes. He points out that we have learned a great deal about the basics of transmitting information (information theory) during the past few years, but that with few exceptions, these new principles have not been widely applied to actual hardware.

With their application, it should be possible to greatly cut size and power of military (and commercial) radio equipment, and increase reliability, Wooldridge points out. The company currently has a military contract for work in this field. R-W's communications division is headed by Dr. Burton F. Miller.

▶**Business Problems Challenging**—Although "systems engineering" is generally associated with military problems, there are very complex problems in the fields of business and industry to which the same approach must be applied if they are to benefit from the use of electrodata machines, such as electronic computers. This includes such problems as production scheduling, inventory control, chemical process control, and airline reservations handling.

R-W is placing its emphasis on the analytical approach to these business problems, using teams of scientists to study the development of new business techniques adaptable to solution by electrodata machines, and new machines required to handle existing techniques. Teams include specialists in economics, math, industrial administration, as well as computers and data handling devices. (Two professors from Carnegie Tech's graduate school of industrial administration, W. W. Cooper and Abraham Charnes, spent the past summer at R-W in this type of work.)

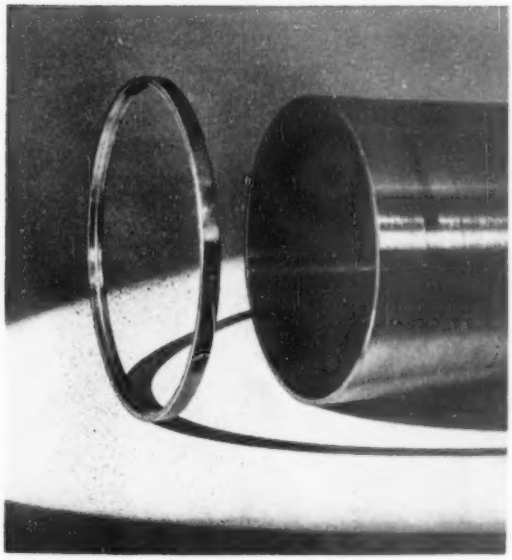
▶**Service, Not Machinery**—For the present, R-W has no machines to sell, hence is in a position to recommend the best possible system for any specific job, using equipment available from a variety of existing manufacturers. Although R-W is developing analog computers for the military, and studying digital computers, particularly for airborne use, Wooldridge believes that the company may never attempt to develop a full line of big computers in competition with such companies as Remington Rand and IBM. Present thinking is that R-W will concentrate on sub-systems which can be used to adapt standard electrodata machines to specialized industrial and business problems.

The company is presently negotiating with several firms, including an undisclosed airline, for electrodata system studies and is currently working on a system for production control for Thompson Products. These activities are assigned to the computer systems division, under William B. Hebenstreit and Dr. Eldred C. Nelson, associate director.

▶**Other Activities**—In addition to the guided missile research, communications, and computer systems division, R-W has a control systems division, under Milton E. Mohr. This group is engaged in radar, fire control, and electronic countermeasures work. The Research Lab, under Dr. Johnson, vice president in charge of R & D, previously devoted a large part of its activities to missiles. Now this work will be carried out in the new missiles division, freeing the lab for its intended mission.

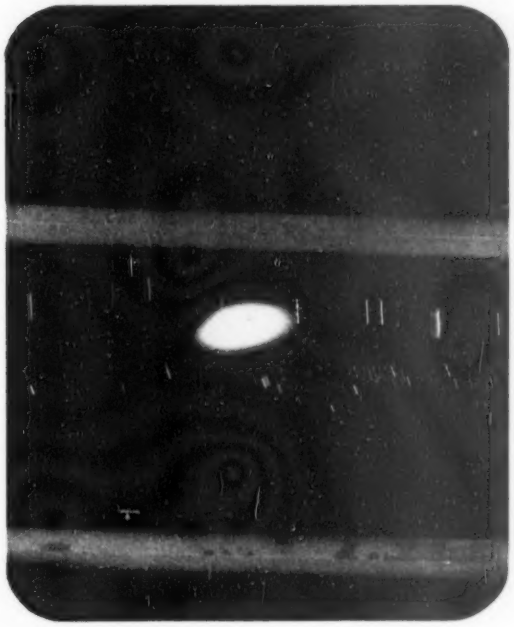
R-W is investing $1.5 million in analog and digital computers and ex-

RADIOGRAPHY reveals...



This stainless steel ring must be brazed to the cylinder. The bond between them must be sound—for the ring must hold the cylinder in place despite high stresses.

a better way to yield a better job!



THIS IS where radiography has done a double job. First, x-rays probed the structure of the bond, showed when it met requirements or when lack of fusion meant the part must be rejected.

Then, radiography went further. It helped reveal a new technic for brazing these two parts—a technic which yielded sound joints almost every time.

So, add another instance where radiography is more than paying its way. By doing such jobs as this, by testing pipeline joints, by proving soundness of the welds in pressure vessels, it is opening up new fields to welders.

Radiography can help you build business as well as earn a reputation for good work. Would you like to discuss how? Talk it over with your x-ray dealer.

EASTMAN KODAK COMPANY
X-ray Division
Rochester 4, N.Y.

Radiography...

another important example of Photography at Work.

Kodak
TRADE-MARK

HAPPY LANDINGS!

When passengers lean back and enjoy the ever-new thrill of landing . . . it's a matter of trust . . . trust in the alert skill of the pilot . . . trust in the strength and precision of the big plane. To build this confidence, aircraft producers and parts manufacturers generally use OSTUCO heavy wall tubing for axles, landing gears, engine mounts, fuel lines, and many other vital aviation parts. If your product requires seamless tubing, formed or fabricated, send us your blueprints for prompt quotation. Latest edition of OSTUCO A-2 Handbook is yours upon request.

Always Specify Ostuco Tubing

ostuco

SEAMLESS AND ELECTRIC WELDED STEEL TUBING —Fabricating and Forging

OHIO SEAMLESS TUBE DIVISION
of Copperweld Steel Company • **SHELBY, OHIO**
Birthplace of the Seamless Steel Tube Industry in America

SALES REPRESENTATIVES: BIRMINGHAM • CHARLOTTE • CHICAGO CLEVELAND • DAYTON • DENVER • DETROIT (Ferndale) • HOUSTON • LOUISVILLE LOS ANGELES (Beverly Hills) • MOLINE • NEW YORK • NORTH KANSAS CITY PHILADELPHIA • PITTSBURGH • RICHMOND • ROCHESTER • ST. LOUIS • ST. PAUL SALT LAKE CITY • SAN FRANCISCO • SEATTLE • TULSA • WICHITA
CANADA, RAILWAY & POWER CORP., LTD.
EXPORT: COPPERWELD STEEL INTERNATIONAL COMPANY
117 Liberty Street, New York 6, New York

pects to have one of the most extensive computing facilities in the West, Wooldridge says.

► **How R-W Was Formed**—In the summer of 1953, Ramo and Wooldridge decided to leave Hughes and form their own company.

Announcement of the formation of R-W was the first public indication of trouble between Howard Hughes and top HAC management, which soon resigned in protest against the owner's policies. Handing in their resignations, Ramo and Wooldridge contacted J. D. Wright and Gen. H. A. Shepard, president and vice president of Thompson Products, both of whom they had known previously. (Shepard was chief of the Air Materiel Command procurement division and later director of procurement and production engineering at the Pentagon, before joining TP.)

The decision to approach Thompson Products "was probably the smartest thing we ever did," Wooldridge says. Ramo and Wooldridge wanted a partner who would provide financial backing, business management assistance, yet not insist upon controlling interest in return. This, Thompson Products agreed to, getting 49% of the voting stock in the new company, and three members on the seven-man R-W board of directors.

TP's three board members are Wright, Shepard, and A. T. Colwell, vice president, engineering research and development.

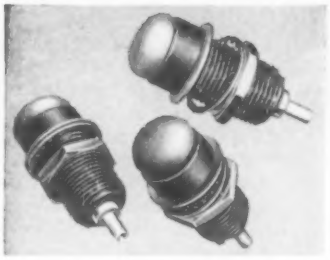
► **Scientists in Dominant Roles**—For the kind of activity that R-W has in mind, its founders believe that technically trained people must have a "more dominant role in the management and control of the business than is customary or necessary in most business organizations."

Two of R-W's four board members, Ramo and Wooldridge are PhDs. The other two are Gen. Harold L. George, former general manager at HAC, and Samuel Gates, corporate attorney.

Wooldridge recognizes the need for guidance in business and financial matters, something which Thompson Products can and does provide in the partnership. Thompson Products has already put around $5 million into R-W, including approximately $3 million to set up the semiconductor operation. R-W's new facility, going up around the corner from their present building, is being financed by and will be leased from TP's pension trust fund.

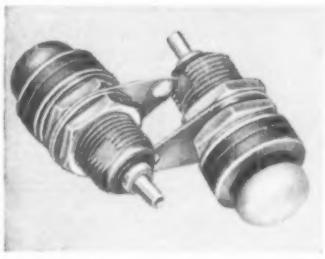
The first two buildings of the new facility, slated for completion in December, plus a third building which will follow shortly, will add 130,000 sq. ft. of space. Pacific Semiconductors has an additional 32,000 sq. ft. in a separate facility.

► **Scientist Is King**—Ramo, who came



EDGE-LIT PANEL MOUNTING
Series L2000

Designed for MIL-P-7788 panels. Sturdily constructed with integral molded-in terminal and snug-fitting plastic lens that will not vibrate loose. Easy to mount. Write for Hetherington Bulletin L1.



REGULAR PANEL MOUNTING
Series L1000

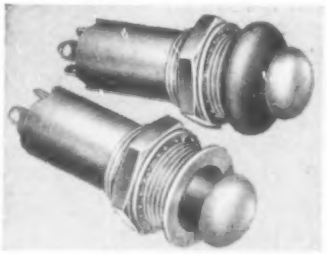
Combines exceptionally small size and light weight with durable construction. Unaffected by heavy shock or vibration. Effectively sealed against moisture. Terminal is molded into the assembly. Write today for Hetherington Bulletin L1.

for maximum dependability

specify

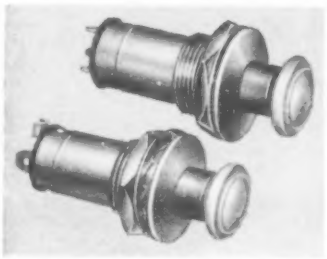
HETHERINGTON
INDICATOR LIGHTS

In addition to the standard indicator lights illustrated, Hetherington produces many adaptations and "specials" for military as well as commercial needs. Write for details on any type.



'PUSH-TO-TEST" INDICATORS
Series L3000

Widely used in military aircraft and ideally adapted to many industrial uses. Bulb is lit by pressing spring-mounted plastic lens button. Supplied with or without silicone rubber boot for moisture protection. Write for Hetherington Bulletin L1.



SWITCHES
WITH BUILT-IN LIGHTS . . .
in a variety of types and switching arrangements save weight and panel space. Write for Hetherington catalog.

HETHERINGTON, INC.
SHARON HILL, PA.
West Coast Division, 8568 W. Washington Blvd., Culver City, Cal.

to Hughes from General Electric's research lab, and Wooldridge, who came from Bell Labs, created the "scientists' environment" at Hughes, which many say was an important factor in attracting HAC's top personnel. (There are others who say that this ivory-tower environment, plus plush offices for top R & D personnel, tended to put too much emphasis on research and development, too little on getting hardware out the back door.)

Ramo and Wooldridge intend to create an atmosphere in which creative scientists can work, applying the results of their previous experience. One evidence of this philosophy is readily apparent, even in the present cramped quarters: most scientists have a private office; at most there are two per room. This is in marked contrast to the "bull pen" arrangements to be found in many companies.

Fifteen college professors spent their summer vacations working at R-W this past year, and the company hopes to line up some for a full year's leave of absence.

▶ **Scientist-Administrator Team**—Each R-W division is headed by a scientist, with one or more administrative assistants to handle organization duties and paperwork. The company is working out details for an advisory council, made up of senior members of the technical and administrative staffs, to discuss company policy and make recommendations in an advisory capacity.

Ramo and Wooldridge had set up a similar group while at HAC.

Wooldridge believes strongly that engineers and scientists, right down to the lowest levels, should be made to feel a part of management and given a sense of participation. Company stock will be distributed to key company executives "upon whom the company's future depends," Wooldridge says. He adds that a profit-sharing plan is under consideration for the future, when company finances justify.

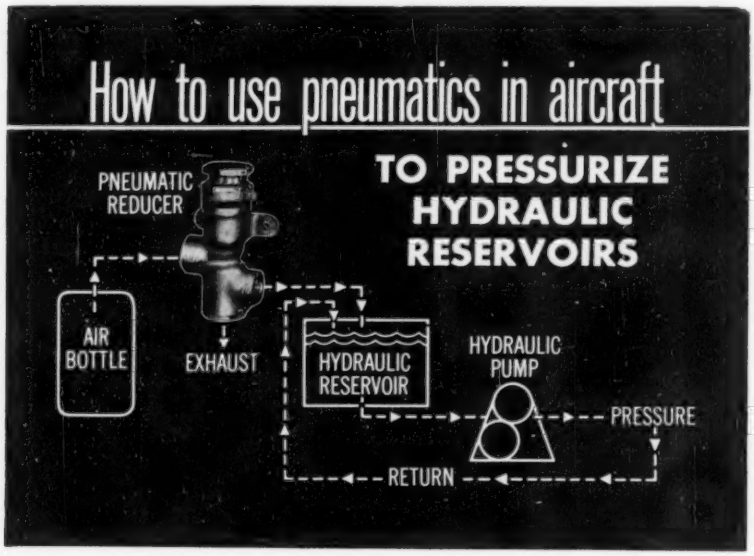
▶ **Semiconductors Different**—R-W recognized that its semiconductor operation, involving large-scale production and marketing problems, differed considerably from the rest of its activities—which explains the separate subsidiary. Wooldridge also recognizes that there is plenty of competition in the semiconductor field, but he is a staunch believer in the "better mousetrap" philosophy. As evidence, he points to the fact that HAC was not the first to enter the diode business, but that it now enjoys 30-40% of the quality diode market, thanks to a superior product. Wooldridge is confident that the new line of semiconductor products which Harper North and his group are developing will do the same for the new company.

Wooldridge expects semiconductors to play a prominent role in R-W's future systems work and says that the company may occasionally call upon its subsidiary to develop specialized semiconductor devices to meet R-W's systems needs.

▶ **What's in a Name**—When Ramo and Wooldridge left HAC, the former was v.p. in charge of operations, the latter was v.p. in charge of R & D. When the new company was formed, it therefore surprised some observers to see Wooldridge take on the administrative duties of president, with Ramo as v.p. in charge of the technical end. The confusion was compounded because Ramo came first in the corporate name.

Asked about this, Wooldridge said that while both men are basically scientists, he had more interest in (and tolerance for) administrative duties while Ramo preferred the technical end, and hence Wooldridge took on the title of president. The decision to give Ramo top billing in the corporate name was based primarily on phonetics. However, Wooldridge admits that the two jokingly talked about putting Ramo's name first to compensate for their respective corporate titles.

Wooldridge told AVIATION WEEK he had no accurate count of the num-



You can use bottled air to prevent cavitation of pumps in aircraft hydraulic systems. The diagram above shows how.

A Westinghouse Pressure Reducer accurately controls the pressure of air supplied to the hydraulic reservoir. This constant pressure assures a steady, dependable flow of fluid to the pump. It gives extra assurance that the pump will not go dry—even under extreme changes in altitude or temperature.

You can also use Westinghouse Aircraft Pneumatic Devices to operate landing gear, brakes, canopies, ejection capsules, and other intermittent operations that require a reliable source of efficient power. Westinghouse devices—especially designed for aircraft—are rugged, uncomplicated, and lightweight. When you have an application for pneumatics call in our engineers. Their 10 years of experience in aircraft pneumatics are at your service.

Westinghouse Air Brake
COMPANY

INDUSTRIAL PRODUCTS DIVISION
AIRCRAFT SECTION
WILMERDING, PENNA.

Manufacturers of air compressors, pneumatic cylinders, actuators, air control devices of all kinds engineered pneumatic control systems and front end loaders.

Factory Branch: Emeryville, Calif. Distributors throughout the United States . . . See your Classified Directory. Distributed in Canada by: Canadian Westinghouse Co., Ltd., Hamilton, Ontario.

package job

This story is wrapped up in seven packing cases. They contain the seven sections of the USAF B-61 Martin Matador pilotless bomber.

It is the story of one of the most tradition-shattering pieces of hardware in this world . . . a zero-launch pilotless bomber that can be deployed to any spot on earth – without having ever been previously assembled – and with total interchangeability of parts.

To realize fully the importance of this package job, you should know these things:

. . . The Matador meets performance requirements more exacting than those of a fighter plane.

. . . Its instrumentation section alone is one of the most functional single packages ever developed.

. . . It is built by new Martin-developed processes that are causing basic changes in industry concepts and production methods.

. . . And it is being delivered at the lowest known cost-per-pound of any military aircraft in production today.

You will hear more about Martin!

MARTIN

BALTIMORE · MARYLAND

(Advertisement)

Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miles,
Senior Member, Aviation Writers Assn.

Frankly, I have little patience with people who squawk about airport noise.

It seems basic to me that those who are troubled by noise shouldn't live near an airport—or a railroad track or a factory or a busy highway, for that matter.

It's the vocal minority that raises all the yammer, and it would be difficult to find among these irate householders more than a few who didn't know the score full well when they moved in adjacent to an airfield.

Now and then you'll find someone who has been sold a bill of goods by a real estate agent—promised, for instance, that the airport was due to be closed shortly. Why they turn angry at the airport rather than the agent is beyond me.

Another mystery is the incongruous fact that among the vocal minority you'll invariably find some residents who work in aircraft factories. Tie that!

One of the big beefs, of course, is the hue and cry about depreciated property values. This despite the fact that tracts and individual homes are constantly encroaching on the surrounding area that once was known as airport "ghost land."

Yet a recent study presented before the American Institute of Real Estate Appraisers (covering six major airports) showed the municipal fields did not affect the values of real estate adversely.

Market behavior was found to be about the same in the airport areas as in other areas... the number of properties for sale was in most cases less... there was no appreciable difference in market behavior even along the approach and takeoff paths... even real estate brokers said the airport had not affected the value of homes adversely ... and if noise, TV interference and anxiety did have any effect on market behavior, it was offset by the amenities resulting from the airports.

The problem of possible crashes goes hand in hand with the noise problem, but here again the airports—in virtually every case—were first and the home owners followed. Actually the chances that a plane might crash in any given spot are remote, but the man who buys a home in such areas must be aware of the chance and in buying he accepts the odds.

This is not to say that municipalities, airport operators, pilots, factories, etc. do not have a responsibility to eliminate noise as much as possible and make flying as safe as is technically and humanly feasible. A great deal of progress has been made in both fields by sane and constructive programs which the citizens of any community have a right to expect.

But even where such programs are in effect, the agonized wails of a few diehards still rend the air, even demanding that the airports be closed, the aircraft factories dismantled. These people feel, apparently, that by buying a home near an airfield they have a right to insist that progress be stopped.

The answer appears to lie in a continuing program of public education and enlightenment to prove to the quiescent majority that the vocal minority members are talking through their hats. It might even convince the squawkers eventually. But it will all be to no avail if there are loopholes of neglect in protecting the public with every possible device and safeguard that active, up-to-date programs can encompass.

The courts have concluded that individual property owners must bear some degree of inconvenience for the sake of the public interest because airports and airplanes have become an integral and important part of our modern way of life, including our national defense.

Airport-area residents are not forced to live within the sound and sight of aircraft. But if they so elect, it is their own decision. And it shouldn't be hard for them to realize, as Civil Aeronautics Administrator F. B. Lee once said, that the sound of an airplane engine overhead is reassuring evidence that our first line of defense and our fastest avenue of commerce is in healthy, active condition.

ber of former Hughes people now at R-W, but he estimated the number at around 30% of the present staff. Wooldridge says that the company has never approached anyone at Hughes and has only hired them after assurance that they were determined to leave anyway. Wooldridge suspects that R-W actually has talked more people into staying at Hughes than the number it has hired.

► **Eyes on R-W**—With an important new USAF interceptor fire control system competition in the offing, people at Hughes and elsewhere are watching to see if R-W joins hands with one of several avionics firms that are itching to break into this business. (R-W took on a consulting-type contract with Westinghouse's Air Arm division to assist in solving its fire control problems, but that contract is now completed.)

In any case, the avionics and electronics industry will be watching to see whether Ramo-Wooldridge will match the early growth of Hughes Aircraft Co.

Cathode Ray Tube Shows Three Curves

A three-gun cathode ray tube, called the industry's first by its manufacturer, for use in multi-channel oscilloscopes which must display three phenomena simultaneously, is one of several recently announced avionic devices.

The new five-inch CRT, Type 53RAP, employs electrostatic focusing and deflection, and each gun can be controlled independently over the entire screen area. Tube can be supplied with Types P1, P2, P7, or P11 phosphors, or other standard types if desired. Technical bulletin is available on request from Electronic Tube Corp., 1200 E. Mermaid Lane, Philadelphia 18, Pa.

Other new devices include:

• **Radar spinner motor,** Type SC-23, reportedly able to maintain constant speed within 1% for load variations of 30%, voltage variations of 10%, is rated at ⅛ hp. Motor operates at 7,100 rpm., has locked rotor torque of 9⅜ lb. in. at 27 v. d.c., and weighs 5½ lb. Manufacturer is Dalmotor Co., 1315 Clay St., Santa Clara, Calif.

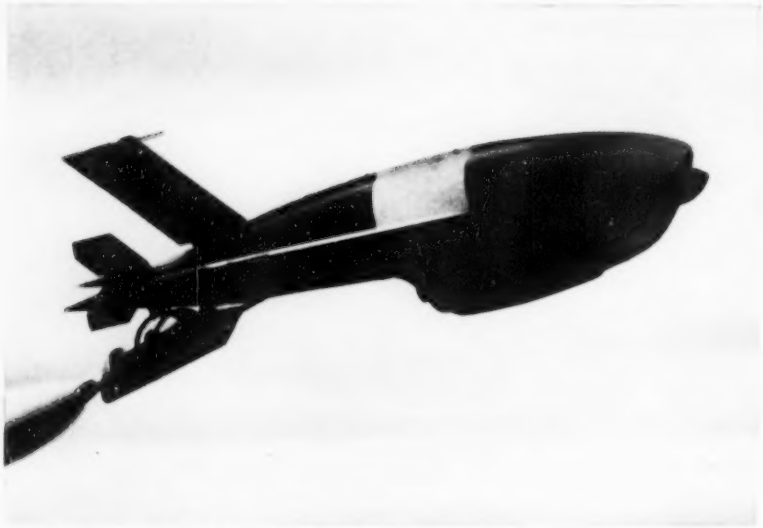
• **Holding coil switch,** Type A1200, is for such applications as prop feathering and autopilot engagement. Device consists of a SPST switch for controlling an external circuit, which is closed when knob is pushed and is held closed by a built-in solenoid until its coil circuit is interrupted. Device weighs 3 oz., measures 15/16 in. dia. x 3⅜ in., is designed for 28 v. d.c. operation. Contacts are rated at 5 amp. for 30 v. d.c. inductive load. Manufacturer is Hetherington, Inc., Sharon Hill, Pa.

• **Rotary actuator,** uses a 110-v., 400-

AMERICAN LATEX' NEW STAFOAM

From a liquid – poured in place: Structural strength, faired surfaces, and a flotation agent (see next page)

Stafoam contributes to high performan



Boosted for two seconds by its 10,000 pound thrust RATO, the Ryan Firebee streaks for altitude after clearing its ground launching site. STAFOAM contributes to ruggedness, simplicity and buoyancy.

The Firebee can be launched by dropping it from a fast-moving launch plane, as well as ground launched as shown on previous page. It proceeds on its own, with electronic direction from a remote ground station.

Firebee has a two-stage parachute recovery system to decelerate it from speeds above 600 miles per hour, and lower it safely to the ground. Landing impact damage can usually be repaired.

Rugged construction and simplicity of design are the primary characteristics of Ryan's new FIREBEE—a *recoverable*, pilotless, jet target missile. STAFOAM—American Latex' new miracle material—contributes to both of these characteristics. The Firebee is a high-speed, high-altitude target missile for use in anti-aircraft and aerial gunnery training, for combat plane interception problems, and for guided missile target work by the Army, the Navy and the Air Force.

For reasons of economy, the drone needs to be used repeatedly—even after landing-impact damage or in case of a direct target hit. Besides rugged construction, it has many novel features directed toward simplicity of assembly and ease in repairing damaged parts. It is composed of only five major assemblies: (1) fuselage, (2) nacelle, (3) wing, (4) empennage, and (5) parachute container. STAFOAM is used in three of these five: the wing, the nacelle, and the empennage. Since this target is also designed for over-water use, a rugged, low-density flotation agent was needed. Ryan's Firebee Project Engineer says, "The requirement for a low-density material for use as a flotation agent in the Firebee drone led to the selection of Stafoam. It is used to fill cavities in which preformed parts cannot be inserted—as well as for preforming parts for later installation. In addition to this versatility, the density of Stafoam may be varied over a large range, depending on application."

Stafoam is a miracle material!

It can be formulated to produce a countless variety of materials. Only a fraction of its applications have been discovered.

STAFOAM is the name applied to all foamed-in-place plastics manufactured by American Latex Products Corporation. It is truly a miracle material! Its applications are so varied, and the results obtained in extreme conditions are so gratifying that it has revolutionized many manufacturing methods and procedures.

STAFOAM can be formulated to produce an astounding variety of materials—from substances so dense that it is difficult to distinguish them from metals, through all degrees of density, to materials so porous that they weigh less than 1½ pounds per cubic foot. Besides the rigid types, materials can be formulated that are either flexible or resilient. Some return to shape slowly, others are difficult to distinguish from natural foam-rubber.

STAFOAM begins with two syrup-like liquids—the resin and the foaming agent. When these are mixed, a foaming action is initiated and the mixture raises like bread dough. It "cures" into a hard, lightweight, uniform mass of tiny cells of tough plastic material. It can be further machined after it has cured. When poured-in-place it forms a bonded core that conforms exactly to the contour of the cavity.

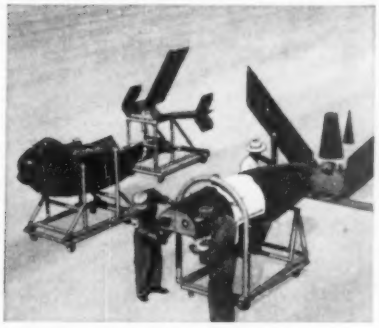
At present STAFOAM is produced in three major types:

(1) Rigid Alkyd STAFOAMS

(2) Rigid Phenolic STAFOAMS

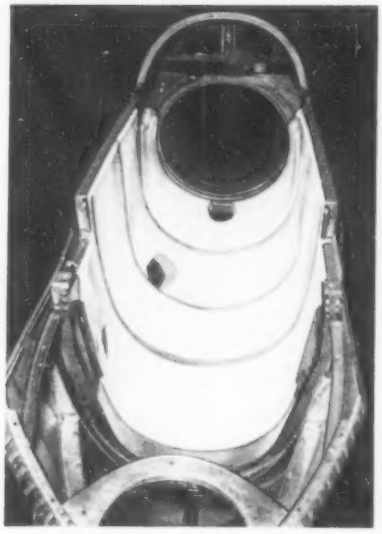
(3) Flexible Alkyd STAFOAMS

ıce of Firebee!



Stafoam is in 3 of Firebee's 5 major assemblies

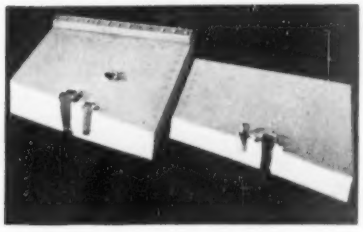
STAFOAM is used in the wings, nacelle, and empennage. The full cantilever wing is unusual in that there are no ribs in the wing panels (they are filled with STAFOAM) other than at the root and tips of the outer panels. Horizontal and vertical stabilizers are of the same type construction. In the nacelle, Stafoam serves as a flotation and fairing agent.



STAFOAM in the spaces between the nacelle frame and the inlet-duct-voids serves as a flotation agent, and – by forming a smooth contour – improves the flow of engine-cooling air.

The large block of Stafoam installed on top of the radiation shield just below the fuselage fuel cell is primarily to add buoyancy to the Firebee for recovery on overwater flights.

After a direct hit...



This cross section through Stafoam-filled aileron shows firmness and lack of crumbling near holes made by .50 caliber machine gun bullet.

NOTE

Because of space limitations in this ad, information is necessarily incomplete. STAFOAM is supplied in hundreds of variations in density, texture, color, strength, insulation and thermal characteristics. For more general information on this truly miracle foam plastic, write for your STAFOAM brochure.

Look at the advantages of Rigid Alkyd Stafoam

ADHESION. Adheres to porous surfaces such as fabric or wood. Metal surfaces require priming. Pre-cast Stafoam can be cemented in place.

ALTITUDE. Stafoam has been subjected to altitudes of 50,000 feet and back to normal with no rupture of the cellular structure.

COLORS. Stafoam can be attractively colored by including suitable dyestuffs in the formulation.

CORROSION. Non corrosive on or near aluminum or ferrous alloys.

DENSITY. Formulations have been compounded to provide densities from 1½ lbs. to 35 lbs. per cubic foot.

ELECTRICAL PROPERTIES. Gives excellent electrical insulation. Can be formulated to be exceptionally transparent to waves of the high frequency electrical spectrum.

FLAME RESISTANCE. Most Stafoams will support combustion, however formulations can be made which are highly flame resistant.

FUNGUS RESISTANCE. Apparently not subject to attack by common fungi. Samples subjected to several types of fungi have shown no effects.

MACHINABLE. Can be cut, milled, sawed, and drilled with woodworking tools.

MOISTURE RESISTANCE. Can be immersed in water for extended periods with only nominal moisture absorption. Not affected by normal atmospheric humidity changes.

POROSITY. Cell size and uniformity of distribution can be controlled by formulation – from an almost amorphous structure to cells of ¼ inch diameter.

REMOVAL. Can be drilled or chiseled.

REPAIRED. Can be re-foamed directly over the original foamed section. The two parts bond automatically.

REPRODUCIBILITY. Formulations, once established, can be reproduced with regard to texture, density, and strength.

RESILIENCY. Structures reinforced with Stafoam have extraordinary vibration resistance, shock resistance and impact absorption.

STRENGTH. Test data are available which prove Stafoam's strength-to-weight ratio is exceptionally high. It is possible to adjust strength to meet specifications.

SURFACE SEALING. Cut surfaces of Stafoam can be sealed by a number of commonly available plastic materials.

TEMPERATURE STABILITY. Temperature cycling between −100°F and +300°F had no appreciable effect on Stafoam.

Rigid Phenolic STAFOAM and Flexible Alkyd STAFOAM have equally amazing properties.

STAFOAM, a registered trademark of American Latex Products Corp., is manufactured under *LOCKFOAM patents owned by Lockheed Aircraft Corp., Burbank, Calif.

** Registered Trademark of Lockheed Aircraft Corporation.*

American Latex Products CORPORATION

3341 West El Segundo Boulevard • Hawthorne, California

WHEN . . . the audio ambient is near the pain threshold,

WHEN . . . clear communication is imperative,

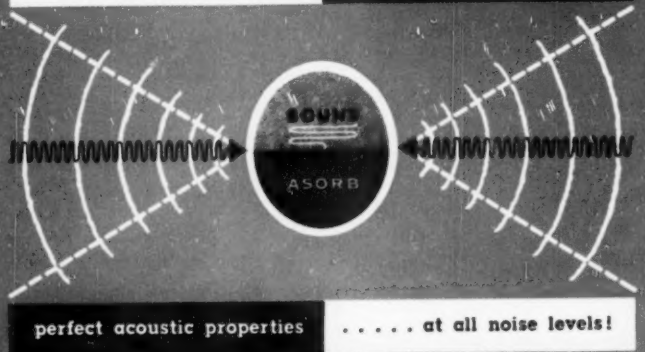
WHEN . . . impact resistance is desired,

AND . . . lightweight comfort is a necessity

THE CHOICE IS . . .

The

SOUND ASORB HELMET



perfect acoustic properties . . . . . at all noise levels!

BILL JACK SCIENTIFIC INSTRUMENT CO.
DEPT. C-5 · 143 SOUTH CEDROS AVENUE · SOLANA BEACH, CALIFORNIA

cycle, single-phase reversible motor with brake. Actuator output is 500 oz. in. at 110 rpm. Stopping tolerance is reportedly within 10 deg. Thermal protection is provided. Western Gear Works, P.O. Box 182, Lynwood, Calif.

• **High-temp switch** is capable of operating over temperature range of −50 to 1,000F. Contacts will carry 5 amp., 28 v. d.c. at 700F, 2 amp. at 1,000F. Manufacturer is Micro Switch, Freeport, Ill.

FILTER CENTER

► **Radar on Windshield?**—General Electric's research lab has developed transparent phosphors which, in combination with flat picture tube developments now in progress (AVIATION WEEK Sept. 20, p. 10), may eventually permit radar information to be displayed directly on an interceptor's cockpit windshield.

► **British Using C-Band**—Recent visitor who inspected British avionics industry reports considerable activity in C-band (5.6 cm.) radar, a frequency which will see its first application here in airborne weather radar.

► **USC Eyes Missiles**—University of Southern California, anxious to get into the missile business, will develop a gyro-stabilized platform, working with American Gyro Co., Santa Monica, which will build the gyros.

► **New Transistor Mike**—RCA has developed a new dynamic microphone with built-in transistor pre-amplifier which United Air Lines is currently testing in a DC-6. RCA unit uses a differential-type mike element designed to reduce external noise pick-up.

► **MATS Tries Selcal**—Military Air Transport Service is testing Selcal, selective calling system which enables ground station operators to call specific aircraft. United Air Lines expects to begin its fleetwide Selcal installation in six months.

► **Oregon Woos Electronics**—The Oregon Development Commission, watching the rapid growth of electronics industry in California, is out to attract some for its state. Promotion put out during the recent Wescon cites "smog-free air" as one of several advantages for Oregon.

► **Rent vs. Buy**—Polarad Electronics Corp. has announced a new plan whereby the electronic test equipment it makes can be rented, with an option to buy. Typical monthly rental charge for $7,000 worth of gear is $400, com-

Original Thinking plus Precision Components

Kearfott Firsts

1947 First with "Penny Size" Servo Motors .938" diam. x 31/32" long.

1948 First with Servo Motors in Navy BuOrd Sizes 15 and 18 featuring straight-thru bores and integral ("potted")* stator-housing assemblies.

1949 First with Navy BuOrd Size 11 Synchros featuring "potted"* stator construction and straight-thru bores.

1950 First with Navy BuOrd Size 11 Servo Motors featuring "potted"* stator construction and straight-thru bores.

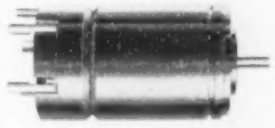
1951 First with Navy BuOrd Sizes 15 and 18 Servo Motor—Rate Generator combinations featuring "potted"* stator construction and straight-thru bores.

1952 First with temperature stabilized Drag Cup Motor-Integrator Generator combinations in Navy BuOrd Size 15 featuring "potted"* stator construction and straight-thru bores.

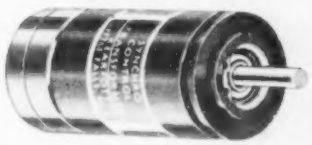
1953 First with Servo Motor-damping Generator combinations in Size 11 featuring "potted"* stator construction and straight-thru bores.

1954 First with 3/4" Diam. "Penny-Size" Servo Motors and Synchros. First with .05% linearity Tachometer Generators in Size 18. First with 115 volt Servo Motor Generator .980" in diameter. All Featuring "potted"* stator construction and straight-thru bores.

3/4" DIA. SERVO MOTOR—FULL SIZE


R500 SYNCHRO—3/4 SIZE

R804 SERVO MOTOR-GENERATOR—1/2 SIZE


3/4" DIA. SYNCHROS—FULL SIZE

*"Potted" construction for optimum performance at lowest cost.

All items discussed and illustrated are in production—available to you for your prototype, pre-production or production systems. Write today for more detailed information.

KEARFOTT COMPONENTS INCLUDE:

Gyros, Servo Motors, Synchros, Servo and Magnetic Amplifiers, Tachometer Generators, Hermetic Rotary Seals, Aircraft Navigational Systems, and other high accuracy mechanical, electrical and electronic components.

Send for Bulletin giving data of components of interest to you.

Kearfott

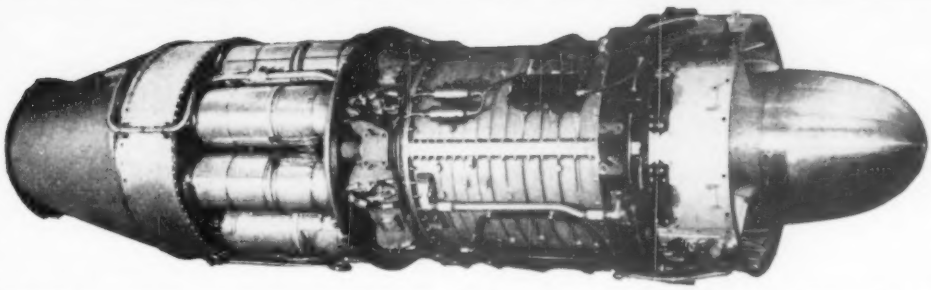
A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORPORATION

KEARFOTT COMPANY, INC., LITTLE FALLS, N. J.

Sales and Engineering Offices: 1378 Main Avenue, Clifton, N. J.
Midwest Office: 188 W. Randolph Street, Chicago, Ill. South Central Office: 6115 Denton Drive, Dallas, Texas
West Coast Office: 253 N. Vinedo Avenue, Pasadena, Calif.

RUGGED OPERATING CONDITIONS in Korea proved stamina of G-E J47 engines installed in North American Aviation F-86 Sabre Jets. Korean combat data also helped G-E engineers increase J47 service life approximately twenty-five percent.

ALLOWABLE TIME-BETWEEN-OVERHAULS ON G-E J47's HAS GROWN STEADILY HIGHER



1954
J47 JET ENGINE

Vital to S.A.C. B-47's and B-36's, the J47's allowable operating time between overhauls has increased to 1200 hours over the past six years.

Why G.E.-jet powered aircraft today fly
FARTHER BETWEEN ENGINE OVERHAULS

Continuing improvement program delivers "more jet engine" per Air Force dollar . . . Here's how—

By applying past manufacturing experience and laboratory studies, test cell reports and operational data, G.E. has increased the allowable operating time between overhauls of its J47 engines from 15 hours in 1948 to 1200 hours (W.M.R.*) in 1954. As a direct result. . .

1. The Air Force now realizes huge savings in J47 overhaul and procurement costs. Estimated savings on the J47-25 alone: $100,000,000.

2. Availability of G.E.-powered aircraft at U.S.A.F. bases is increased. A S.A.C. B-47 recently logged more than 600 hours without a single engine change.

Actually, all the reasons behind the tremendously successful J47 engine program come down to one: General Electric's jet engineers constantly seek rock-hard facts on how to improve G-E engines—then put the facts to work.

*With Minor Repair.

Three thousand design improvements have been made in the J47 since 1948. New compressor blades withstand vibration better and give increased engine life. Ceramic-coated inner liners have replaced ordinary metal liners for longer operating life.

Add the J47's anti-iced "hot nose" which protects the compressor from ice particles . . . its new cross-fire tubes . . . new exit rings . . . floating turbine shroud, new transition liners, channel-fairing tailcones, curvic-coupling rotors, re-designed water nozzles—these and hundreds of other improvements make up the reason why G.E.-jet powered aircraft today fly farther between engine overhauls.

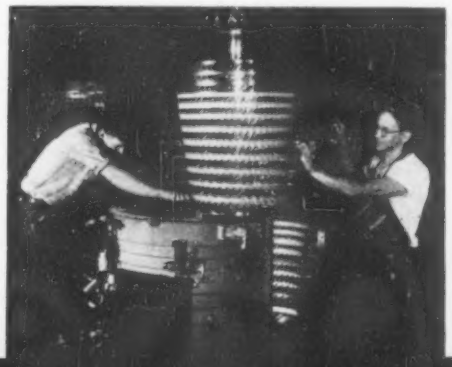
And progress like this illustrates why G.E. remains the world's largest producer of jet engines. *Section 230-22, General Electric Company, Schenectady 5, N. Y.*

Progress is our most important product

GENERAL ELECTRIC

CERAMIC-COATED LINER developed by G.E. increases operating life of G-E engine combustion chambers, permits higher temperatures.

LATEST ASSEMBLY METHODS assure precision alignments necessary for maximum engine life, yet bring new turbojets off production lines faster.



CLOSE QUALITY CONTROL to maintain exact tolerances of component parts is another reason G-E jets fly farther between engine overhauls.

This man can help you

with your design plans involving bellows or bellows assemblies

M. G. CALHOUN
one of our staff of bellows application engineers.

HE CAN SHOW you how a bellows assembly can do the job. He will work with you on the bellows design . . . advise you on the metal required—brass, stainless steel, monel or nickel. He will recommend the correct bellows charge—volatile liquid or gas.

He'll help you on many more factors that will make your design plans more efficient. You'll be assured of a bellows assembly *exactly* suited to your needs—to help your products perform as planned.

There are many uses for Sylphon and Bridgeport bellows assemblies—for thermostatic devices, pressure controls, hydraulic mechanisms, expansion joints, motion transmission, as flexible connectors and in more applications.

Let our engineers, our half-century of experience and ample production facilities work for you—save you time, money and trouble. Get full information. Write today.

SEND FOR FREE BULLETIN

Idea-filled Bulletin tells you all about metal bellows and bellows assemblies. Send for your free copy today. Ask for Catalog TA-1400.

Robertshaw-Fulton
CONTROLS COMPANY

FULTON SYLPHON DIVISION
KNOXVILLE 1, TENNESSEE

BRIDGEPORT THERMOSTAT DIVISION
BRIDGEPORT 1, CONNECTICUT

pany says. (Industry has been turning to rental plans for facilities and equipment to conserve working capital and because of tax advantages.)

► **Flush and Fine**—University of California scientists have developed a new flush radar antenna, only 5 in. in diameter, which is said to produce a very sharp pencil beam. Designed by Dr. R. W. Bickmore, the new antenna reportedly contains a series of eight ring-like slots, one inside the other, in a smooth metal surface. Slots can be filled with non-conducting plastic to reduce drag.

► **Industry Scuttlebutt**—Unconfirmed report says that RCA may soon set up a microwave tube lab in the San Francisco area, close on the heels of General Electric's similar move. Much of the microwave tube industry is clustered around Stanford University, center of know-how in this field.

► **Symposium Proceedings**—Proceedings of the Automatic Production of Electronic Equipment Symposium, held last April in San Francisco, have been published by Stanford Research Institute which sponsored the event with USAF. The 119-page volume, including 17 papers and a transcript of the concluding panel discussion, costs $4.00. Write SRI, Public Relations Office, Stanford, Calif.

► **RCN Orders British PAR**—The Royal Canadian Navy has ordered precision approach radar from Standard Telephones & Cable Ltd., for installation at Navy's airfield in Dartmouth, Nova Scotia. —PK

Avionic Bulletins

Recently announced technical bulletins and literature of interest to persons in the avionics field include the following:

• **Pressure transducer,** Model S-3, for transient and high frequency measurement, diaphragm-type using a variable reluctance pickoff. Performance and calibration curves included (10 pp.) Ultradyne Engineering Labs, Inc., P.O. Box 8007, Albuquerque, N. M.

• **A.C. rate generators,** with high voltage output, for 60- and 400-cycle use (4 pp.) Ford Instrument Co., 31-10 Thomson Ave., Long Island City, N. Y.

• **Yaw damper,** Model 1500, for use on highspeed aircraft (16 pp.) System performance characteristics, weight and component sizes are given. Lear, Inc., 3171 S. Bundy Drive, Santa Monica, Calif.

• **Precision cams,** a wide variety of single and dual input (three dimensional) are described, with data on applications and tolerances. In 4-page bulletin available from Ford Instrument Co., 31-10 Thomson Ave., Long Island City, N. Y.

• **Metal-film pots,** "General Design and Performance Characteristics of Film-Type Potentiometers," a technical paper presented at the 1954 Electronic Components Symposium, may be obtained from Barry J. Hawkins, Fairchild Camera & Instrument Corp., 225 Park Ave., Hicksville, N. Y.

Positioning that tolerates no plus-or-minus...

no problem even in a 2500-mile-an-hour gale

Within the foot-square throat of a new adjustable wind tunnel, adjusted by a device that has scores of amazing commercial applications, winds are generated to "fly" sleek scale models of tomorrow's aircraft at speeds as high as 2,500 miles an hour.

The throat of this supersonic wind tunnel can be quickly and precisely adjusted to an infinite variety of shapes to produce air speeds up to 2,500 miles an hour. A battery of 158 AEROL Ball-Screw Mechanisms moves up or down to flex a stainless steel throat lining to any shape desired... then *holds* that shape against the 40-mile-a-minute buffeting.

The AEROL Mechanisms we make combine the power or the speed of a steel screw with the friction-free rolling of steel balls, (illustrated at left in cutaway drawing). Friction loss is held to less than 10% of the power input... motor size can be cut practically in half with no loss of output; less space is required for motors; power costs are reduced.

Highly precise positioning is an important feature of AEROL Ball-Screw Mechanisms. Precision threads and perfect balls provide metal-to-metal contacts that permit the assembly to move effortlessly and to position *exactly* at the desired spot... with no springiness, no drift, no rebound.

AEROL Ball-Screw Mechanisms designed to your requirements, can make a device move more easily, multiply its power, or lift a weight. They are doing similar jobs today for many industries. Write on your company letterhead for Booklet C-104.

Cleveland Pneumatic
Tool Company CLEVELAND 5, OHIO

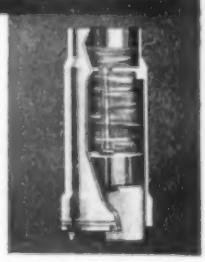
Department C-104

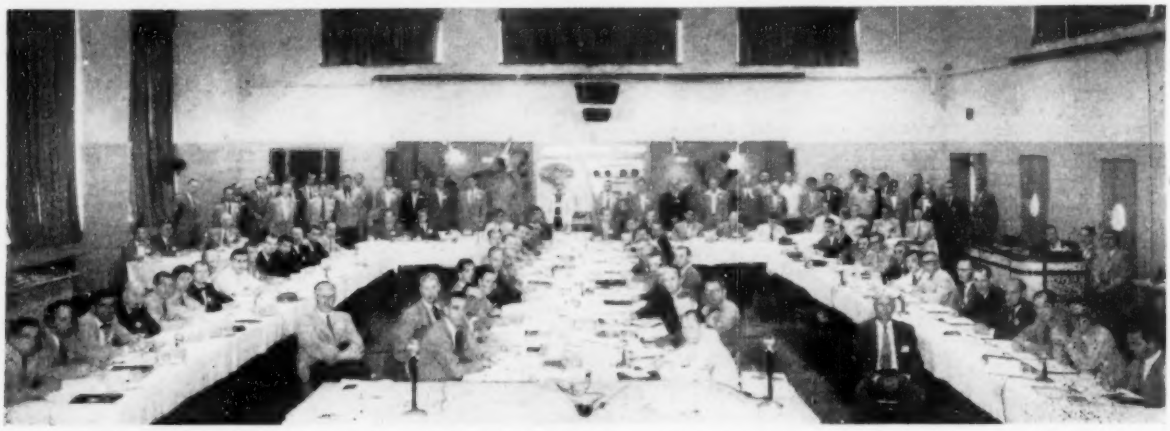
BALL-SCREW MECHANISMS AIR-OIL IMPACT ABSORBERS

World's Largest Manufacturer of Aircraft Landing Gears

To CUSHION SHOCK

● CPT's shock absorber principle combines pneumatic and hydraulic cushioning. It can control minute vibrations or tons of impact. It is the shock absorber for the largest aircraft landing gears (CPT is the world's biggest manufacturer of landing gears), and the same principles are often adapted to finger-sized units. May we discuss with you how to take the shock out of stopping or the motion out of vibration?





SCINTILLA DIVISION of Bendix Aviation Corp. plays host to 100 aircraft engine ignition experts at annual conference at Sidney, N. Y.

Experts Study Year's Ignition Advances

By George L. Christian

Sidney, N. Y.—Many of the hundred or so experts at Bendix-Scintilla's Aircraft Engine Ignition Conference here looked for a change in Scintilla's position toward piston engine ignition equipment as a result of the growing role of jet and turboprop transports in the commercial picture.

They expected that Scintilla's emphasis would be on improved design of existing reciprocating engine ignition equipment, with reduced stress on new developments.

However, company engineers soon made it clear that they expect the piston engine to be around a lot longer than many jet enthusiasts believe. Clayton Welch, chief of service engineering, told the meeting of a number of new Scintilla projects. Two of them show special promise:

• **New distributor** that does not use carbon brushes. Distributor action in this unit is completely electrical. Its use does result in some electrical losses, but these are small enough to be acceptable, Welch says. If laboratory tests bear out early results, Scintilla will produce complete engine systems for testing by engine manufacturers. This distributor would require a completely new design of distributor and ring manifold.

• **New high-frequency ignition system** which uses standard type spark plugs. Single-cylinder tests of the system have shown good results, and Scintilla is now building units for tests of complete engines. Earlier high-frequency ignition systems, developed for practically all larger engines, were discarded after a promising start and much testing by manufacturers and in the field. Their greatest drawback lay in the high cost of the special spark plugs, since transformer coils had to be built into each plug.

► **Trouble Shooting**—The three-day conference went into detailed exposition of troubles and malfunctions the airlines and military were having with Scintilla ignition equipment, and heard careful, explicit accounts concerning what Scintilla, the airlines, or both were doing to correct the troubles. No punches were pulled nor feelings spared in the discussions—the meeting was factual and honest.

Welch gave the experts detailed descriptions of what Scintilla has been doing with regard to the following engines: Pratt & Whitney R2000 high-tension ignition; P&WA R2800, high- and low-tension ignition; Wright R3350, high- and low-tension; P&WA R4360, high- and low-tension. Some of the more important items Welch mentioned follow.

R3350

• **Magnetos.** There has been very little change in the R3350 low-tension magneto, which has been giving exceptionally good service. A reinforcing strip installed in the housing between the coil cores to support the pole pieces in the housing appears to have corrected the problem of rotors rubbing the pole pieces.

"Channel"-type breakers have been incorporated in the mags to give better support to the breaker arm. Use of American Felt Co. felt and Thuban 250 lubricating oil have also materially contributed to improved operation.

• **Distributors.** Use of coil ("mouse trap") type springs and new-type carbon (E112HH) brushes making contact with graphitized plates have resulted in better distributor operation although too-rapid brush wear is still a problem.

Better manual spark advance operation has been assured by the use of an improved, more vibration-resistant relay control.

• **Harness.** Harness removal (to facilitate changing the engine's torque pump when required) has been simplified by making slots in the steel mounting brackets. A kit has been provided which allows the manifold lead to be disconnected from the magneto.

• **Transformer coil.** R3350-BD engine's transformer coil housing is being changed to a stainless steel can to prevent handling damage. The Hypersil type of coil, used in later model engines, has been provided with arc-welded steel cans.

R4360

• **Magnetos.** As with the R3350 mags, the breaker has been changed to incorporate the American felt-Thuban oil combination to improve breaker life. The cam follower has been lengthened by .016 in. to improve felt-cam contact through better lubrication.

A wide bearing has been installed in the cam end of the magneto and the Gits oil seal has been changed to a lip-type seal.

Hard rubber inserts have been installed in the plug-in connectors to keep pins from being pushed out.

To eliminate open-circuit condenser problems, the unit has been provided

MISSILE SUSTAINERS *by RMI*

TARGET-*REACHING* MISSILE POWER...

Rocket power sustains the flight of guided missiles on their military mission.

RMI rocket engines of advanced design provide unfailing power for defense.

Interesting positions with a permanent future are available for experimental Engineers, Chemists, and Physicists to staff our expanding Research and Engineering facilities. Send resume to Personnel Director.

RMI

RMI ENGINES POWER THE

BELL X-1A REPUBLIC XF-91 DOUGLAS D558-2

MARTIN "VIKING" FAIRCHILD & CONVAIR "LARK"

and various classified projects

Special Products ROCKAWAY, NEW JERSEY

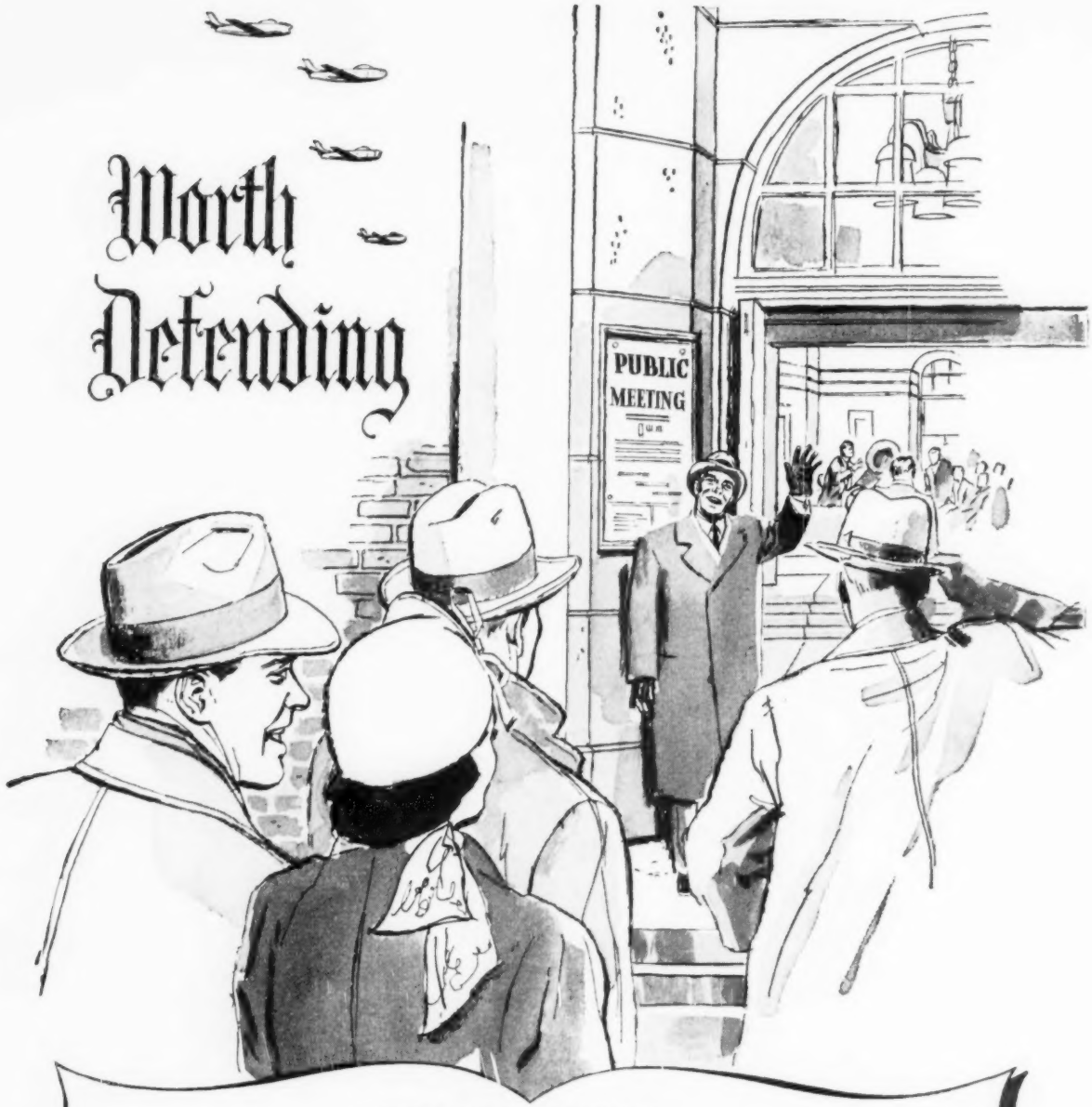
Test Areas DOVER, NEW JERSEY

REACTION MOTORS, Inc.

DENVILLE, NEW JERSEY *Engineering Research Administration*

AFFILIATED WITH OLIN MATHIESON CHEMICAL CORPORATION

Worth Defending



FREEDOM OF ASSEMBLY

Public assemblies, the sounding boards of what people feel and want, the moulding pots of public opinion and influence are the sworn foes to any form of autocratic government. They are the first to be banned when totalitarianism gains a foothold — and they never return.

The right of free assembly is among the very fundamentals of democracy, the very air that free men must breathe. Think it over... Freedom of Assembly is *worth defending.*

CASA-19UST

C-L CANADAIR LIMITED

CANADAIR

— AIRCRAFT MANUFACTURERS —

LIMITED, MONTREAL, CANADA

One of a series dedicated to the survival of freedom — Reprints on request.

A subsidiary of GENERAL DYNAMICS CORPORATION, New York, N.Y. — Washington, D.C.

with a steel can and spot-welded ground tabs.

Primary mag leads have been changed to a Wirelon steel cable type. Terminals are swaged on instead of being soldered.

• **Harness.** Harness modifications include changing outlets from brass to stainless steel to avoid damage, and use of the hard rubber inserts.

High tension leads have been changed from the conduit-type with steel elbows to a plastisol-impregnated, three-layer silver braid sleeving as on the R2800 engine.

• **Distributor.** Distributor plates have been graphitized to reduce carbon brush wear.

R2800

• **Magneto.** The primary coil has a screw-type winding terminal to support the winding and prevent wire breakage. It also has an improved nylon covering.

An O-ring-type seal has been provided on the drive end bearing retainer plate to keep oil from entering the mag. Unit also has channel breaker and uses American felt and Thuban oil.

• **Leads.** Primary distributor leads have been changed to Wirelon type with extruded nylon covering.

• **Condenser.** The condensers have been changed to high-temperature-type and the brass can changed to steel.

• **Distributor.** On the distributor (which is integral with the harness on the R2800 installation), Heli-Coil inserts are now used on the collector plate mounting pads. Collector plate bosses have been removed to allow proper plate rework and to make it possible to shim them accurately.

Distributor blocks are graphitized to improve carbon brush operation. Distributor finger has been changed to the coil-spring-type finger.

Manifold outlets have also been changed from brass to stainless steel and a "Y" lead with coupling nuts has been provided from manifold to transformer coil to facilitate "Y" lead rewiring.

Spark Advance

Welch went into the subject of spark advance in considerable detail.

Should spark advance be controlled manually or automatically?

Theoretically, automatic control would appear to be more desirable because it does not impose an additional duty on a plane's crew member. But, from a practical aspect, automatic control does not turn out to be feasible. Reason is that engine rpm. range during which the spark is to advance is in the neighborhood of 1,150 to 1,350 rpm. Retarded range is approximately 2,350 to 2,550 rpm. Since the distributor turns at only one-half the crankshaft speed this means that the advance and retard have to take place within a distributor range of only 100 rpm. each. To manufacture units with such precise automatic controls on a production basis is not practical, Scintilla found.

Also, as cruise rpm. increases, it begins trespassing into the spark advance operating range with the result that one distributor may be in the advance position while the other distributor on the same engine may be in the retard position—a most undesirable situation.

▶ **Four-Breaker Type**—In attempts to make a distributor and a spark advance system which would move instantaneously into either the advance or retard position, Scintilla came up with the so-called four-breaker type of spark advance. But engine manufacturers and some airframe companies still held that the operation of the new advance system should be automatic.

Numerous types of automatic controls were devised—all being hooked up to carburetor pressure differential, carburetor linkage or to the engine's manifold pressure. All these actuation sources proved to be unreliable—some actually undesirable—for automatic control.

▶ **Manual Control**—So, by the process of elimination, manual control appeared to be the only practicable means of actuating spark advance instantaneously and within the narrow engine rpm. limits specified by the manufacturers. It was decided that the spark position should be relay-controlled.

The first relays produced by Scintilla did not prove to be satisfactory. Scintilla blames this on two reasons:

First, because of the great pressure on its production department to turn out large quantities of relays, not only for production distributors but also for kits to convert engines already in service, testing of the relays was limited.

Second, although the relays were vibration-tested, the test frequencies apparently were different from those experienced in actual service. Result was that Scintilla found that they "had a number of types of failures in reasonably low hours of the frame, the coil and the type of spring suspension."

The relay was redesigned. The new type is capable of operating over 500 hours without giving trouble, as opposed to 25-100 hour-failure rates for the old-type relays.

Two other relay improvements which Scintilla is working on are use of rubber buttons on the adjustable stop screw to reduce vibration amplitude limit of the point-opening flapper from .015 in. to .008 in., and use of phenolic instead of nylon stop buttons, an installation which Scintilla is currently testing.

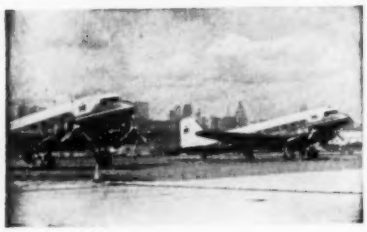
This latter has markedly improved wear considerations within the relay under critical vibration conditions. As an example, Scintilla cites these figures: Although the nylon button would not wear, it would displace from .003 to

Convair 'Flying LST' Opens Up

Big 82-ton Convair R3Y-2 turboprop Tradewind nestles up to a dock and shows how it can quickly load heavy equipment, such as bulldozer, through its upward hinging bow door. In amphibious actions, the R3Y-2 flying boat can taxi right up to a beach for support. It can carry 103 passengers or 92 litter patients or guns, tanks or other cargo. Powerplants are Allison T40s. Navy expects to be operating a fleet of R3Y Tradewind flying boats by the end of this year. Speed is near 400 mph.

"ONE MILLION MILES—SAFELY with AIRWORK OVERHAULED ENGINES"

says International Harvester's Chief Pilots W. R. Dotter and Raoul Castro



The IH fleet averages nearly 200,000 miles a year on Airwork engines—and stays 100% available for service.

Airwork CORPORATION
Millville, New Jersey
NEW YORK MIAMI WASHINGTON

.006 in. in about 3-5 hours of critical vibration testing. Substituting the phenolic button shows only .002 in. wear in 50 hr. of operation.

► **Other Types**—Scintilla believes that its approach to the relay problem is correct—namely to use the type of relay it is using and locate it within the distributor.

It is the simplest, lightest, smallest relay Scintilla knows that will do the jobs. Other types have been considered. Latching types have the disadvantage of requiring an additional wire running through the harness manifold. A double-throw relay would not only require additional control, but almost twice as much space as the present relay.

Taking the relay out of the distributor and locating it in some less vibratory spot entails a number of undesirable features, such as providing plug-in connectors on the relay, running additional leads through the engine and using condensers in the distributor to prevent breaker point arcing.

Scintilla engineers are confident that, when the two latest anti-vibration improvements are incorporated in relays on production distributors, the units will last for a whole engine run of 1,000 hr. or more.

Magnetos

Scintilla is devoting considerable research time and engineering energy to stretching the life of its magnetos to the full overhaul life of the engines on which they are mounted.

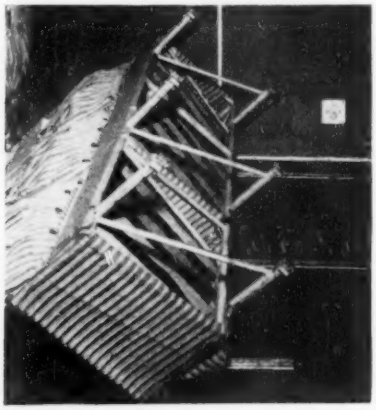
One tool effectively used by Scintilla research personnel technicians in determining which avenues to pursue is the highspeed moving picture camera. Samples of the highspeed movies showing magneto cams, breakers and points in action were projected for the conference and allowed visitors to see how Scintilla engineers fingered weak spots in the mag.

Use of American felt and Thuban oil plus increasing cam follower height have given definite improvements, Welch feels. He says that bench running mags thus equipped show a life increase from 500 hr. to 1,000 hr. during which the mag's timing changes 3 deg. This 100% improvement has not been reflected in actual service use of the new felt and oil. Nonetheless, Welch is confident that service improvements of 25-50% have been achieved as a result of these changes.

He noted that little more can be done to improve materials or lubricants, nor can cam finishes be appreciably bettered.

► **New Cam & Breaker**—Welch outlined a new and promising cam-breaker combination which Scintilla designed and is currently testing. Initial test results show that, on a 1,000-hr. test run, timing change was only a small 1%. Engine runs have shown improvements to be in the same ratio, but

From the drawing boards that engineered the famous V-200-12 A
a new Valcor Solenoid Valve
lighter
IN RELATION TO
FLOW
than any other Solenoid Valve made
WEIGHT .33 lbs.
USES
Auxiliary Power Units
Fuel Systems
Deicing Systems
Water Injection Systems
The new VALCOR V-3900 is unique. The exceptional operating advantages of the VALCOR floating seal design has been improved even further—
New ruggedness at ½ the weight
New compactness at ½ the weight
New dependability at ½ the weight.
Yet the same flow capacity as the V-200-12A.
This remarkable achievement means a greater freedom of design for the engineer than ever before. The VALCOR V-3900 is setting new standards of Solenoid Valve performance where low pressure drop and lightweight are a factor.
Pat. Pend.
VALCOR SOLENOID VALVES
VALCOR ENGINEERING CORP., CARNEGIE AVE., KENILWORTH, N. J.



Quick-Change Seats

A 64-passenger DC-4 can be converted to a cargo carrier in less than an hour, using Brown-Line track and accessory items for securing the seats, the manufacturer claims. Fittings, bolted to the seat legs, lock into the tracks. By lifting and turning the fitting retainers, the seats come out in seconds. Here is the installation in a Western Air Lines DC-4. Other users of the system include Cal-Eastern, Braniff, NWA, Flying Tigers-Slick, USAF and Convair 340 customers, says Brown-Line Corp., 341 North Foothill Road, Beverly Hills, Calif.

Artillery Spotting

Communications

Wire Laying

Supply Drops

Army Cessnas=Successful Missions!

Photo Reconnaissance

Shown here are just five of the tough military jobs assigned to hard-flying Army aviators in Cessna L-19s. Other jobs: control of military highway traffic, fast transportation for field commanders, evacuating wounded, pilot training, courier work, flare dropping, airborne radio relay, even insect spraying. During civil emergencies, L-19s are also used by Army National Guard units.

How can *one* airplane do so many jobs successfully? L-19s are designed to be versatile! These rugged all-metal airplanes offer 213 h.p. performance, high-wing visibility, short take-offs and landings, outstanding load-carrying and slow-flight characteristics and require less maintenance than any other Army airplane! Cessna has delivered every L-19 to U. S. Armed Forces on schedule since 1951!

Cessna
AIRCRAFT COMPANY

CESSNA AIRCRAFT COMPANY, WICHITA, KANSAS

Your future's on the rise when you're an aviation electronics engineer with RCA!

FIRE CONTROL
PRECISION NAVIGATION
COMMUNICATIONS

POSITIONS IN: | ***SYSTEMS, ANALYSIS, DEVELOPMENT or DESIGN ENGINEERING***

Specialize in: Radar . . . Analog Computers . . . Digital Computers . . . Servo Mechanisms . . . Shock & Vibration . . . Circuitry . . . Heat Transfer . . . Remote Controls . . . Sub-Miniaturization . . . Automatic Flight . . . Design for Automation . . . Transistorization.

You should have 4 or more years' professional experience and a degree in electrical or mechanical engineering, or physics.

In these positions at RCA, there's a real engineering challenge. You'll enjoy professional status . . . recognition for accomplishment . . . unexcelled facilities . . . engineering *graduate* study with company-paid tuition . . . plus *many* company-paid benefits. Pleasant suburban and country living. Relocation assistance available.

Look into the RCA career that's waiting for you! Send a complete resume of education and experience to:

Mr. John R. Weld, Employment Manager
Dept. B-450J, Radio Corporation of America
Camden 2, New Jersey

RCA Tmks. **RADIO CORPORATION OF AMERICA**

not enough time has been accumulated to arrive at final conclusions.

The entire concept of the new cam breaker is new. The cam is made of a sintered material and is oil-impregnated. The breaker cam follower is attached directly to the main breaker contact spring instead of being a separate follower.

This is how Welch described its operation: "The follower contacts the cam between the breaker points and the spring anchor point which requires less lift for the follower to open the points the same amount. The follower contacts the cam only during the opening of the breaker."

He added that the follower is graphite-impregnated molded Bakelite which has very excellent wearing qualities. Scintilla is doing a lot of additional work in its laboratories to iron out some operational wrinkles. In the meantime, the company has sent out a number of these cams and breakers to engine manufacturers for test.

Present cams and breakers are being engineered for the P&WA R4360 Wasp Major, since this engine appears to be more critical of cam/breaker life than other powerplants.

Distributors

For the last year-and-a-half, Scintilla has pushed a very intensive development program to improve carbon brush distributor performance. Under H. C. Walters, assistant director of engineering, the program includes continuous tests using ten R4360 mags, six R2800 ignition systems and two R3350 ignition systems. Also included in the effort are vibration tests and endurance tests under vibration.

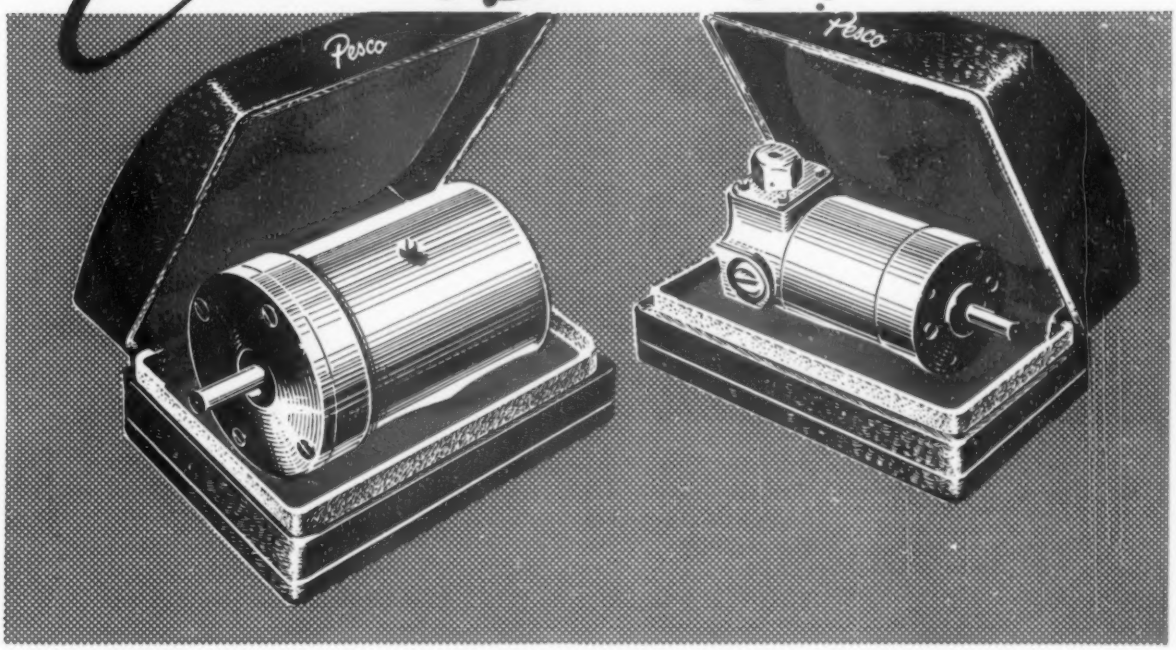
Magnitude of the program can be judged by the fact that Scintilla has currently accumulated 144,000 unit testing hours on carbon brushes of which about 14,000 hr. has been on vibration endurance. Scintilla says that its goal is to come up with a full-engine-run distributor. And this development program is contributing a wealth of information which will allow Scintilla to design such a distributor as soon as possible.

Problems of the distributor's carbon brushes have changed. Until recently, the poser was erratic burning of individual segments or plates while carbon brushes remained sufficiently long and had enough pressure on the plates. This situation was corrected by using the E112HH carbon for the brushes and graphitizing the distributor plates.

Current trouble is that over a period of time the brushes wear down to the point where they will no longer make constant contact with the plate, which causes plate burning.

Scintilla discovered, in an effort to

Custom Built*



*WITH STANDARDIZED PARTS

Pesco "coordinated-frame" electric motors provide you with several important advantages.

First, they provide maximum power packaged in a minimum-sized unit to meet every installation and operating requirement from .01 to 11.0 horsepower.

Second, by using standardized Pesco parts in a series of coordinated frame sizes, Pesco lowers unit cost and greatly simplifies the stocking of service parts.

Finally, Pesco motors are supplied for DC or AC in a full range of voltages. DC motors are available with Series, Shunt, or Compound windings, 6 to 120 volts, 1/100 to 11 horsepower, and speeds up to 15,000 rpm.

Pesco AC high frequency induction motors of the squirrel cage type are available in 1 or 3-phase types for 400-cycle operation at various voltages. These motors range from 1/100 to 9 horsepower at speeds up to 12,000 rpm. Motors are produced in all types of enclosures for continuous or intermittent duty.

When your electric motor requirement demands (1) dependable power, (2) minimum space, and (3) minimum stocking of service parts—YOUR BEST BUY IS PESCO.

Call or write the Home Office, Bedford, Ohio for full information on these outstanding PESCO products.

engineering Pesco production

PRODUCTS DIVISION

AGRICULTURAL · INDUSTRIAL · AIRCRAFT · AUTOMOTIVE · CONSTRUCTION · EARTH MOVING

PRODUCING THE BEST IN HYDRAULIC EQUIPMENT AND ELECTRIC MOTORS

BORG-WARNER CORPORATION

24700 NORTH MILES ROAD • BEDFORD, OHIO

it takes two

DISPLAY ADVERTISING

- AROUSES INTEREST
- CREATES PREFERENCE

DIRECT MAIL

- GETS PERSONAL ATTENTION
- TRIGGERS ACTION.

After your prospect has been convinced by DISPLAY ADVERTISING, he still must take one giant step. *He must act.* A personalized mailing piece direct to his desk, in conjunction with a display campaign, is a powerful action getter.

McGraw-Hill has a Direct Mail Division ready to serve you with over 150 specialized lists in the Industrial Field.

To get your copy of our free INDUSTRIAL DIRECT MAIL CATALOGUE (1954) containing complete, detailed information about our services, fill in the coupon below and mail it to McGraw-Hill.

Do it now! The best advertising programs are planned well in advance.

Direct Mail Division,
McGraw-Hill Publishing Co., Inc.
330 West 42nd St., N. Y. 36, N. Y.

Please forward my free copy of the McGraw-Hill "Industrial Direct Mail Catalogue."

NAME_____

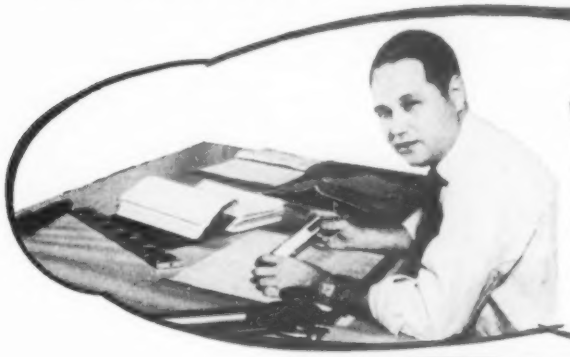
COMPANY_____

ADDRESS_____

CITY_____ STATE_____

AIRCRAFT ENGINEERS—

IT ADDS UP FOR YOU



WORKING AT LOCKHEED

Pleasant working conditions as a part of the happy, dynamic group who are planning new, original and different aircraft for the skies of tomorrow, right amidst the practical demonstrations of manufacturing the aircraft of today, make present and future most desirable.

+

LIVING AND RECREATIONAL ADVANTAGES OF GEORGIA

Year-round mild climate and the cultural and recreational advantages of this area located in the foothills of the Blue Ridge Mountains combine with a balanced economy of agriculture and manufacturing to make living here in the present and future most desirable.

=

Working at Lockheed and living here in North Georgia, added together, equals a healthy, happy family. It can be yours.

If all this sounds ideal—it's only because it is that way down here. You can get complete information with no trouble to you at all. Just fill in and mail the coupon and we'll do the rest. Naturally all replies are held in strict confidence. May we suggest that you mail the coupon NOW!

ENGINEERS NEEDED

STRESS STRUCTURES
DYNAMICS DESIGN
LIAISON SERVICE MANUALS
RESEARCH PRODUCTION DESIGN
MANUFACTURING RESEARCH
DRAWINGS CHECKERS
AERODYNAMICISTS

LOCKHEED
AIRCRAFT CORPORATION

Look to Lockheed for Leadership

GEORGIA DIVISION
MARIETTA, GEORGIA

Clip and Mail

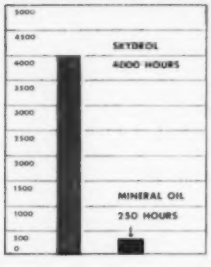
so we can contact you with complete information.

LOCKHEED AIRCRAFT CORPORATION—DEPT. AW-10-11
761½ Peachtree St., N.E.
Atlanta, Georgia

Name_____
Address_____
City_____ State_____
Job interested in_____

Air Force Adopts SKYDROL For C-118A Superchargers

After test studies lasting more than a year, fire-resistant Skydrol hydraulic fluid is now specified for the superchargers of all new Douglas C-118's of the Military Air Transport Service. With this improvement, chemical-base Monsanto fluid will replace present petroleum oils.



SKYDROL OUTLASTS MINERAL OIL 16 TO 1

Saves taxpayers money. Skydrol has long been approved for 4,000 hours in Douglas cabin supercharger transmissions, compared with 250 hours for mineral oil fluids. Thus, fewer fluid changes and reduced servicing save the Air Force money.

Skydrol's lubricity is demonstrated by the longer service life of component parts in Skydrol lubricated systems.

Skydrol is noncorrosive to aircraft metals and alloys.

Skydrol is readily adaptable to all types of aircraft with minor changes to the hydraulic system.

Skydrol is stable at required operating temperatures and pressures.

Write for *24-page brochure containing technical data on Skydrol. Organic Chemicals Division, Monsanto Chemical Company, Box 478, St. Louis 1, Missouri.*

MONSANTO
CHEMICALS – PLASTICS

SERVING INDUSTRY...WHICH SERVES MANKIND

obtain the best possible plate finish, that stick type graphitizing is not as successful as lapped type graphitizing. However, results of most tests were bafflingly erratic, making it hard to draw logical conclusions concerning what were the proper brush and plate combinations to use. A brush-and-plate configuration that gave good life in the R2800 or R3350 installations had a rate of wear 12 times higher in a R4360 installation.

▶ **Springs**—In checking the role brush springs play in distributor operation, Scintilla found that production conical springs had a resonant vibration range of about 900-1,000 cps., which would actually lift the brush off the plate, causing burning. The newer, coil or "mouse trap" springs were developed. Scintilla says that with these new units its engineers were unable to detect any movement or resonant vibration up to 2,000 cps.

Tests of a new distributor finger were inconclusive. Twelve new fingers were sent for test to American, TWA, Pan American, United and Eastern. This is the failure rate pattern: TWA- 1; AA- 2; PAA- 2; UAL- 3; EAL- 7. Nonetheless, Scintilla feels that this new finger is quite an improvement over the standard finger and is continuing development work.

A poser which complicates Scintilla's investigation is that many fingers were returned with three of the four carbon brushes in good condition. Yet the fourth, which operated in exactly the same environment, at the same temperature and under identical conditions

Streamlined ADF

Speed of a Lockheed Lodestar business plane has been upped by about seven miles per hour by installing the ADF loops in a Plexiglas nose cone. Plane, owned by Kollsman Instrument Corp., N. Y., was modified by Mallard Industries, Inc., Bridgeport, Conn.

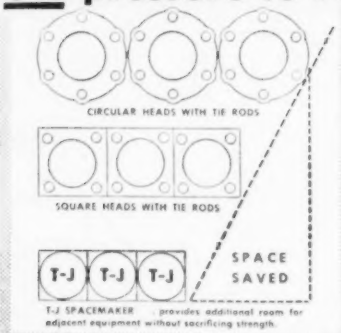
Snap-on* VACUUM GRIP PLIERS ...the right pliers for every job!

● Choose from more than 30 Snap-on types and sizes. Each is built to perform its specific gripping, cutting or twisting function *faster, easier, more safely* than any other pliers. Snap-ons are heat-treated from surface to core and the jaws, cutting edges and joints are locally tempered to exact degree of hardness and toughness for greatest durability. Write for catalogs described above. Snap-on branch warehouses in principal industrial centers offer direct service to industry everywhere.

SNAP-ON TOOLS CORPORATION
8112-J 28th Avenue, Kenosha, Wisconsin
*Snap-on is the trademark of Snap-on Tools Corporation

T-J
Spacemaker
CYLINDERS

OIL pressure to 750—AIR to 200 P.S.I.



Now the sensational new T-J Spacemaker sets the pace in compact cylinder design and efficient performance!

New "Self-Aligning" adjustable oil cushion means faster acceleration and better cushion than ever before . . . New T-J Super Cushion Flexible Seals for air insure positive cushion with automatic valve action for fast return stroke.

More plus features include—heavy wall, precision honed, hard chrome plated, seamless steel body . . . leakproof cylinder head to body construction . . . heavy duty, high-tensile, *hard chrome plated piston rod.* Write for bulletin SM-454-2. The Tomkins-Johnson Co., Jackson, Mich.

T-J TOMKINS-JOHNSON
RIVITORS . AIR AND HYDRAULIC CYLINDERS . CUTTERS . CLINCHORS

of vibration as the three, was worn down to the point where it no longer made contact. This excessive wear on a single brush sometimes takes place in less than 100 hours.

In its effort to reduce carbon brush wear in distributors, Scintilla is taking a long, hard look at types and pressures of the springs which hold the brushes against the plates. The unguided coil spring exerts a pressure of 18-20 oz. The spring has the desirable characteristic of allowing the brush to wear down .040 in. to change the spring pressure one ounce. This compares favorably with another design incorporating a conical spring whose characteristics are .005 in. wear per ounce.

Welch summed up Scintilla's efforts to design and manufacture a good distributor finger this way: "There are several versions of unguided brush fingers and it has taken quite a little contriving on the part of our design engineers to adapt the coil spring application to the unguided brush type of finger. I believe we are getting very close to a very satisfactory finger."

▶ **Other Improvements**—Welch listed these promising types of distributors and innovations in internal construction which are being tested:

- **Shock mounted** distributor whose mount dampens out much vibration, especially at the higher frequencies.
- **Quill-shaft-type** of distributor, 25 of which have been built. These require still further investigation.

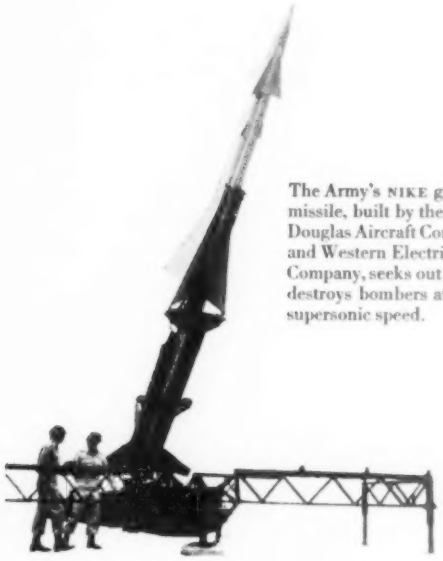
Another new distributor design in-

Steers a Cutlass

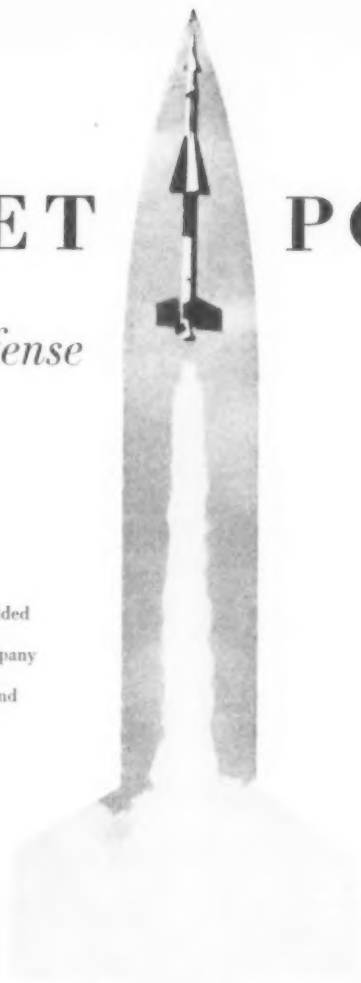
Production Chance Vought F7U-3 Cutlass jet fighters are being fitted with hydraulically steerable nose wheels which can be turned 60 deg. either way of center, permitting faster maneuvering on tight carrier decks, where every minute is important. Pushing a button on the control stick makes the mechanism operative. Torque link steering equipment is built by Bendix Aviation Corp.

ROCKET POWER

for Land-Sea-Air Defense



The Army's NIKE guided missile, built by the Douglas Aircraft Company and Western Electric Company, seeks out and destroys bombers at supersonic speed.



The Navy's P2V takes off with the aid of Aerojet-General smokeless JATOs.

Originator of JATO, Aerojet-General has produced more than 300,000 for assisted-takeoff of piloted aircraft.

Aerojet-General liquid-propellant rocket powerplants permit increased payload for Air Force Boeing B-47B jet bomber.

Aerojet-General has developed and manufactured rocket powerplants for guided missiles and piloted aircraft since awarded its first contract by the Armed Forces early in World War II.

Successful performance of its rocket engines, missile boosters, ordnance weapons and auxiliary powerplants of many types has earned Aerojet-General's reputation for rocket dependability.

Aerojet-General's production facilities, including its 14,000-acre plant site near Sacramento, guarantee low-cost, on-time delivery of rocket powerplants of any size and in any quantity.

SOLID AND LIQUID PROPELLANT ROCKET POWERPLANTS FOR MISSILE AND AIRCRAFT APPLICATIONS

THRUST REVERSERS (SNECMA)

AUXILIARY POWER UNITS AND GAS GENERATORS

ELECTRONICS AND GUIDANCE

ORDNANCE ROCKETS

EXPLOSIVE ORDNANCE AND WARHEADS

UNDERWATER PROPULSION DEVICES

ARCHITECT-ENGINEER SERVICES FOR TEST FACILITIES

Aerojet-General

CORPORATION

A SUBSIDIARY OF THE GENERAL TIRE & RUBBER COMPANY

AZUSA, CALIFORNIA
CINCINNATI, OHIO
SACRAMENTO, CALIFORNIA

THE GENERAL TIRE

Aerojet-General needs:

Chemists
Electronic Engineers
Mechanical Engineers

Piasecki

HAS IMMEDIATE OPENINGS FOR

★ EQUIPMENT DESIGN STAFF ENGINEER
To Be Responsible For All
Helicopter Equipment Engineering

★ POWER PLANT GROUP ENGINEER
Must Have Turbine Experience

•

DESIGNERS–STRESS ENGINEERS
Rotor or Transmission Experience Desired

•

AERODYNAMICISTS
Helicopter Experience Required

•

VIBRATIONS ENGINEERS

•

STRESS ENGINEERS
Aircraft Experience Required

•

STRUCTURAL TEST ENGINEERS

•

FLIGHT TEST ENGINEERS

•

FLIGHT TEST INSTRUMENTATION ENGINEERS

All Of The Above Positions Require Minimum Of Three Years Aircraft or Related Experience and Degree in Engineering

Send Complete Resume To
FRANK COE, EMPLOYMENT MANAGER

PIASECKI HELICOPTER CORPORATION

Morton, Pennsylvania
(Philadelphia Suburb)

PRECISION INVESTMENT CASTINGS BY "AERO" MAY CUT YOUR COSTS!

CASTINGS: in hard to machine alloys—saving costly machine operations.
CASTINGS: of intricate shapes, close tolerances, smooth finish-eliminating production problems.
CASTINGS: several parts combined into one casting-saving assembly operations.

YOUR BLUEPRINTS AND/OR PART SAMPLES WILL RECEIVE PROMPT ATTENTION.

AERO INVESTMENT CASTINGS CO.

2996 East 72nd Street CLEVELAND 4, OHIO

corporates, several new design features:

• **Distributor segment plate** is made part of the distributor unit.

• **Complete shock mounting** of the unit to absorb torsional vibration. This requires a flexible, or quill-type of shaft to drive the distributor from the spline drive and still allow it to move on its mount.

• **Top timing provision** to allow timing to be accomplished with a ratchet on the top of the shaft, rather than on the spline end as is present practice.

• **Pre-loaded bearings** are used and more space is allowed for the distributor finger. Type of finger to be used will be decided later.

This unit will require a completely new distributor, distributor ring, manifold and bowl.

Welch cited samples of the many suggestions Scintilla receives. Among them:

• **Locate distributor carbon brush** on the outside diameter of the finger in what might be called a "barrel-type" of distributor. Purpose would be to take advantage of centrifugal force acting on the brushes to press them against the plates.

• **Use multiple carbon brushes** on a cylindrical plate or have plates with cylindrical segments which would function something like collector rings instead of having the currently used distributor plate. This appears to have certain advantages. But such a design would require about 22 carbon brushes to do the job now handled by four brushes. This led Welch to conclude that "it looks very probable that we would only be transferring our troubles from one type of design to another." This is borne out by the fact that Scintilla has actually tested this type of distributor and that it does not seem to lick Scintilla's problems.

OFF THE LINE

Lake Central Airlines has equipped its entire fleet with the Grimes anti-collision, rotating beacon. The airline says it has installed the light at the top of the fin on all of its DC-3 Centraliners. The 100-watt bulb is automatically turned off below a certain speed to keep the light from burning out when plane is on the ground and air passing across the light is insufficient to cool the unit adequately.

Bendix Radio has sold RDR-1 airborne radar systems to Remmert Werner, St. Louis; Page Airways, Rochester, N. Y.; and Ohio Aviation, Dayton, for installation in executive aircraft. The RDR-1 set is used for weather mapping and aerial navigation.

Only a synthetic oil meets its lubrication specs.

How tough are lubricant specifications for new U. S. turbo jets? Well, they call for an oil pumpable at -65 degrees F, yet able to lubricate critical turbine bearings at over 450 degrees F. They call for flash point, viscosity, and load-carrying properties that just can't be combined in any existing mineral oil.

Esso research teams went to work on the problem. The result is a synthetic oil, Esso Turbo Oil 15. With more than 200,000 hours of engine test-stand and flight experience, it has met all specifications and tremendously increased turbo jet and turbo-prop performance.

Esso Turbo Oil 15 lubricated the premier flights of the North American F-100 (above), Boeing 707 and B-52, Convair F-102, Douglas A4D. A proud record for the Esso research teams.

Continuing research at Esso laboratories promises an even greater future for synthetic oils as gas turbine performance reaches new highs.

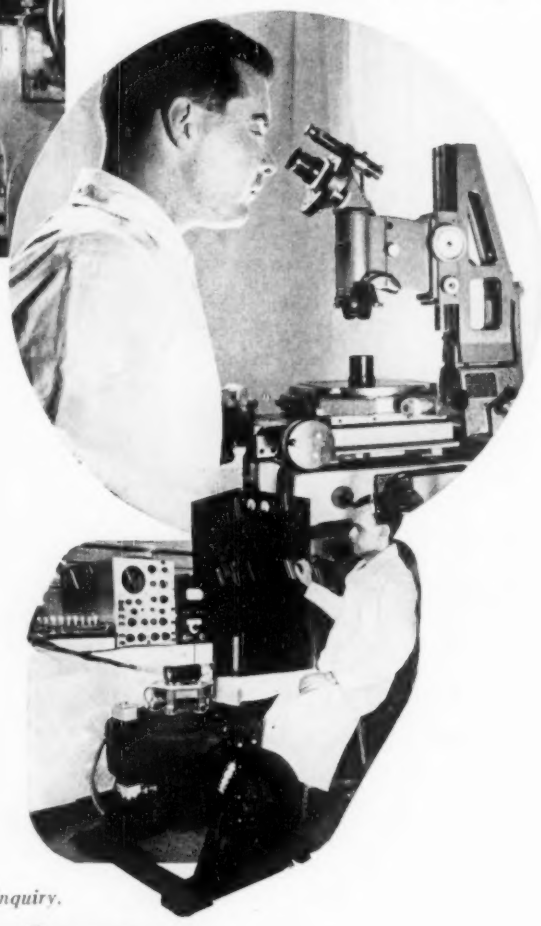
Esso

AVIATION PRODUCTS

RELIABILITY ASSURED

WITH NEW DIAPHLEX *Sealed Relays*

DIAPHLEX RELAYS ARE NOW PACKAGED AND SEALED WITH THE SAME QUALITY ASSURANCE AS EMPLOYED IN THE PRODUCTION OF INCANDESCENT LAMPS.



This quality assurance is made possible by the use of electronically controlled contact welders, inert materials, highly refined instrumentation for performance measurement, sterile parts assembled in dust-free air-conditioned rooms, advanced quality control techniques and similar advancements in the art of fine instrument manufacture.

Extensive endurance and MIL qualification tests conducted by Inland Testing Laboratories verify the necessity for these extra safeguards.

Satisfactory relay performance under actual field conditions conclusively substantiate the fact that precise manufacture under controlled conditions and electronic inspection methods are essential prior to sealing and inert gas charging and mass spectrometer leak detection.

Furthermore a large portion of Diaphlex relay output is assembled into Cook manufactured "Brain Boxes" and electronic gear which furnishes first-hand experience with relays engineered for the job.

These measured results coupled with the experience of skilled workers who have been trained for the past decade in relay design, tooling, fabrication and assembly "Assure the Reliability" of Diaphlex relays.

We invite your inquiry.

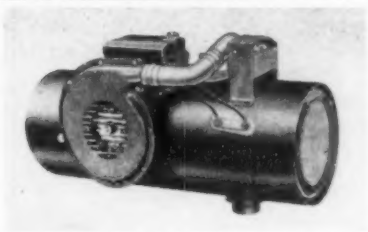
Cook Electric Company

Established 1897

2700 Southport, Chicago 14, Illinois

Diaphlex—Aircraft Components and Accessories • **Wirecom**—Wire Communications, Protection & Distribution Apparatus • **Magnilastic**—Expansion Joints, Heavy Industry Equipment, and Airframe Structures • **Cook Research Laboratories**—8100 Monticello Avenue, Skokie, Illinois • **Inland Testing Laboratories**—1457 Diversey Parkway, Chicago 14, Illinois • **Electronic Systems Division**—2533 N. Ashland Avenue, Chicago 14, Illinois • **Subsidiary: Canadian Diaphlex Limited**—Aircraft Components and Accessories, Toronto, Ontario, Canada • **Plymold Division**—3415 Belmont Avenue, Chicago 18, Illinois.

NEW AVIATION PRODUCTS



SOUTH WIND self-contained heater.

New Combustion Heater Comes in Single Package

South Wind is marketing a self-contained combustion heater for private and commercial aircraft.

Model 940 weighs 20 lb., burns a quart of fuel an hour to deliver 20,000 Btu. It is said to meet all CAA requirements for use in unpressurized cabin heating installations, in planes with 12-v. or 24-v. d.c. electrical systems.

The new unit includes the usual South Wind safety features, says the company, such as a safety valve and filter assembly; a sealed case for the fuel control valve, with provision for overboard drain line; a double seal on the fuel line; provision for shrouding the exhaust pipe; separate air source blower for combustion air, with a duct attachment for picking up outside air.

Size is 16⅞ x 9¼ x 6⅞ in.

South Wind Div., Stewart-Warner Corp., 1826 Diversey Pkwy., Chicago 14, Ill.

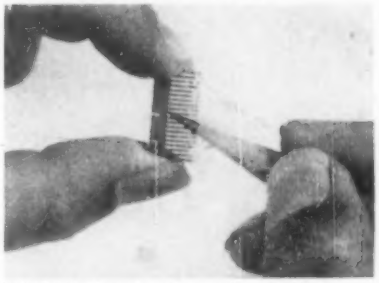
Simplified Metal Melter Handles Small Quantities

High-frequency induction metal melting unit in which the melting table is integral with the cabinet to save space and provide greater efficiency of operation has capability of handling from one pound to 100 pounds of material. It is also capable of handling induction heating applications.

There is only one control handle and one indicating meter. No adjustment of the spark gap is necessary and maintenance is practically negligible, the maker notes. It is available in sizes from 5 kw. to 40 kw.

Also available are motor-generator type high-frequency metal melting equipments for larger requirements from 100 lb. to several tons, with sizes ranging from 20 kw. to 1,250 kw.

Inductotherm Corp., 620 East Glenolden Ave., Glenolden, Pa.



EKTRON detectors are ultra-sensitive.

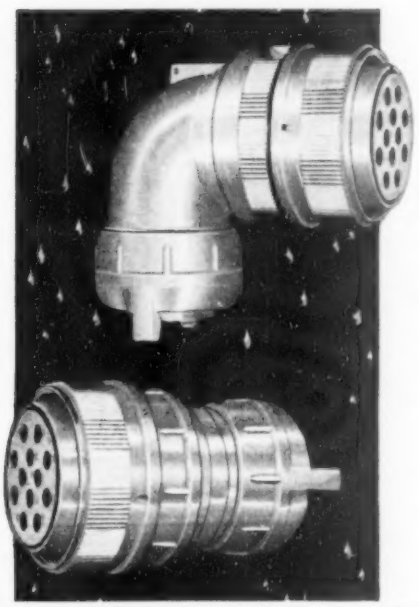
Infrared Light Triggers Heat-Sensing Cell

Sensitivity 10,000 times as great as that shown by previous laboratory-type infrared-sensing devices is claimed for a new cell developed by Eastman Kodak.

Known as the Kodak Ektron detector, the cell is sensitive to all colors of visible and ultraviolet light, but is especially affected by infrared. Active element is lead sulfide.

Kodak suggests possible use of the Ektron detectors in complex electrical equipment in place of mechanical switching devices; in automatic control of chemical processing; for auto-

Now! BENDIX·SCINFLEX waterproof plugs



for use with multi-conductor cables

These new Bendix*-Scinflex *waterproof* plugs are a modification of our standard AN type "E" (environment resistant) connector. They are designed to meet all "E" performance requirements when used with multi-conductor cables. Each plug includes a modified AN3057B cable clamp which provides inward radial compression on multi-conductor cables. This unique feature completely eliminates cable strain—a common source of circuit trouble.

In addition, there are gaskets at all mating surfaces and an accessory sleeve is available to accommodate an extreme range of cable sizes. A folder describing this new waterproof plug—and the various sizes in which it is manufactured—may be obtained by writing our Sales Department.

* TRADE-MARK

THESE BUILT-IN FEATURES ASSURE TOP PROTECTION AGAINST CIRCUIT FAILURE:

Shock and Vibration Resistant

Die Cast Aluminum Shell

Cadmium Plate—Olive Drab Finish

Moisture-Proof, Pressurized

High Arc Resistance,

High Dielectric Strength

Silver-Plated Contacts

Resilient Inserts

SCINTILLA DIVISION Bendix AVIATION CORPORATION SIDNEY, NEW YORK

Export Sales: Bendix International Division, 205 East 42nd St., New York 17, N. Y.

Bendix

Factory Branch Offices: 117 E. Providencia Avenue, Burbank, California • Brouwer Building, 176 W. Wisconsin Avenue, Milwaukee, Wisconsin • Stephenson Building, 6560 Cass Avenue, Detroit 2, Michigan • 512 West Avenue, Jenkintown, Pennsylvania • 8401 Cedar Springs Rd., Dallas 19, Texas • American Building, 4 South Main Street, Dayton 2, Ohio

The Reader AUDITED PAID CIRCULATION ABC *His Mark*

THE ABC SYMBOL, which appears at the head of this page, is your brand—the reader's brand—on this magazine. It stands for Audit Bureau of Circulations. It means that this magazine will stay in business only so long as it continues to serve its readers to their satisfaction.

That Bureau—known for short as ABC—is a voluntary, nonprofit, cooperative association founded in 1914 by a group of publishers, advertisers and advertising agencies who wanted to establish and maintain higher standards of publishing practices than then prevailed. Its primary and specific purpose was to set up yardsticks to appraise circulation values and to verify the claims of publishers as to their circulations. For the buyer of advertising space this provides an effective means to take some of the guesswork out of buying and to reconcile the conflicting claims of competing publishers. BUSINESS WEEK magazine has aptly described ABC as "the publisher's conscience—and cop."

BUT IN DOING that job, ABC performs another function of high importance to the readers of ABC member publications. It provides a constant pressure on the publishers to keep alive in their staffs a sense of primary responsibility to their readers. That is because the most simple and direct method of making a publication responsible to its readers is to place upon it a purchase price, whether by subscription or newsstand purchase. The right to purchase or to refrain from purchasing a publication gives to the reader and to no one else the power to pass effective judgment on the publisher's success in serving the reading public. Each paid publication will grow or languish, will prosper or fail, in proportion as it wins or loses the following of thousands or millions of readers. The readers, by their patronage, record their judgments as to whether the publisher and his publication are measuring up to their responsibility to them.

And that is where the ABC comes into the reader's picture. The newspaper or magazine that carries the ABC symbol on its masthead must in the first place be a paid circulation publication. Moreover, it must conform to the high standards set up by the Bureau as to terms of payment and accounting methods. And again it must open all of its books to the auditors of the Bureau on demand.

SINCE THE INFORMATION thus determined by thorough and impartial audit is periodically made public through the ABC statements and audit reports, it is constantly available to and universally used by advertisers who are considering the purchase of space in an ABC publication. These reports show the circulation trend, as verified and certified by ABC, and thus put the advertisers in a position to know whether or not the publisher is rendering satisfactory service to his readers.

Thus the publisher who submits his publication to the supervision and discipline of ABC affirms in the strongest possible manner that he recognizes his primary obligation is to his readers and that he owes his standing to a voluntary demand by those readers. It follows that the editors of ABC publications must be exceptionally alert to the desires of their readers and responsive to their needs, since any decline in circulation will soon show up in the ABC statements and audit reports.

THAT IS WHY we describe the ABC symbol as the reader's brand. It shows that a publication must be primarily responsive to him and that he holds in his own hands its success or failure. And that ABC symbol is not only a constant reminder to him of that fact, but also an equally constant reminder to all concerned that the reader's willingness to pay for the ABC publication is the acid test of its value to him and to the advertiser.

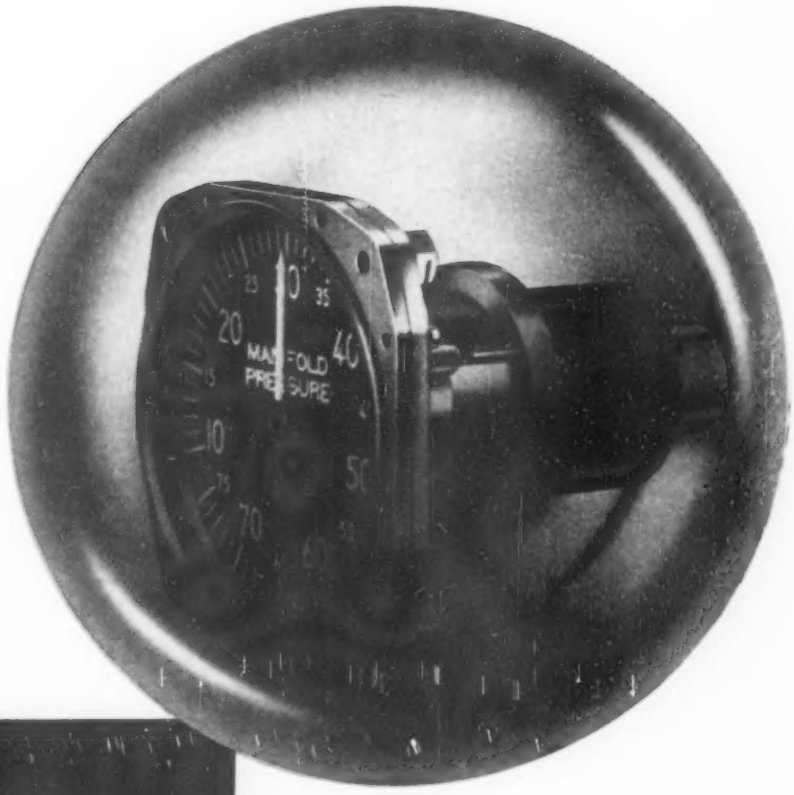
McGraw-Hill Publishing Company, Inc.

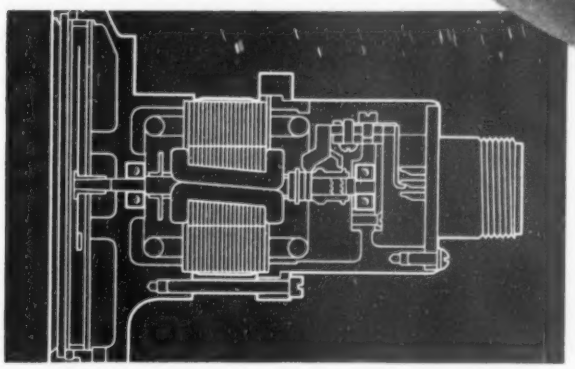
"TOPS" IN LOW-TORQUE APPLICATIONS

Low-starting-torque bearings are very important in instruments like Kollsman's Manifold Pressure Indicator.

To assure ball bearings with this characteristic, or to meet even more critical requirements, New Departure uses highly sensitive automatic testing equipment capable of measuring torque variations as little as one or two thousandths of a gram centimeter.

When designing instruments it will pay you to talk to your New Departure engineer about your bearing needs.





NEW DEPARTURE SALES ENGINEERING OFFICES—AT YOUR SERVICE

BRISTOL 269 North Main St. 2-6371
BOSTON
517-A Park Square Bldg. Hancock 6-9867
KANNAPOLIS, N. C. Box 1086 2-3181
NEW YORK 1775 Broadway Circle 6-1540
PHILADELPHIA
850 E. Luzerne St. Garfield 3-4136
SYRACUSE 2360 James St. 73-5195
DETROIT
7-122 General Motors Bldg. Trinity 2-4700
CINCINNATI 2107 Carew Tower Main 5783
CLEVELAND
3113 W. 110th St. Winston 1-5454
INDIANAPOLIS
1357 W. 16th St. Imperial 4680
PITTSBURGH
Cathedral Mansions Mayflower 1-8100
CHICAGO 332 S. Mich. Ave. Wabash 2-5875
DAVENPORT
2212 E. 12th St. Davenport 7-7522
KANSAS CITY
1021 E. Linwood Blvd. Valentine 4939
MILWAUKEE
647 W. Virginia St. Broadway 6-9460
ST. LOUIS
3001 Washington Blvd. Franklin 6533
LOS ANGELES
5035 Gifford Ave. Logan 8-2301
BERKELEY 1716 Fourth St. Landscape 6-8750
SEATTLE 5000 First Ave., S. Lander 5920

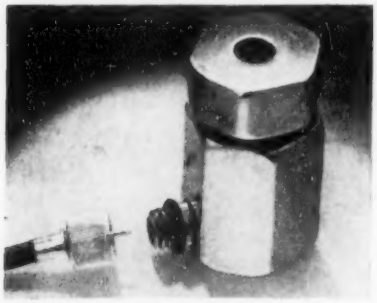
NEW DEPARTURE
BALL BEARINGS

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT
Plants also in Meriden, Connecticut, and Sandusky, Ohio
In Canada: Wallaceburg Industries, Ltd., St. Catharines, Ontario

matic monitoring of exact composition of fluid flowing through pipes.

Present price, which company expects to reduce: $14.18 apiece in quantities of 11 and more.

Eastman Kodak, Rochester, N. Y.



MINIMUM MASS simplifies installations.

High Sensitivity Marks Dynamic Force Gage

Full-scale expansion of dynamic phenomena is stated possible with new force gage design having extended frequency range and large output for detailed testing of servo systems, wind-tunnel balances, vibration-force generators, structures and the like.

Small size and easy coupling allows use of the gage in servo linkages, force balances and mechanical systems where minimum mass is necessary. The 15-lb. force gage weighs less than one ounce and is 5/8" hex by one-inch long.

Model 2101 offers a full scale output of three volts for each range. Sensitivity remains constant over the frequency range of 10 cps. to 5 kc. when loaded with 100 megohms or more resistance. Gages will be available for inputs from 15 to 1,000 lb.

Endevco Corp., 689 South Fair Oaks Ave., Pasadena 2, Calif.

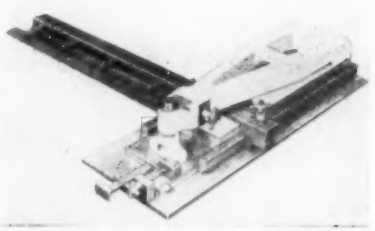
Computer Averages 30 Thermocouple Readings

The average temperature reading of as many as 30 thermocouples is worked out instantaneously and continuously by a new engineering aid.

The device—Computer C-1029—is said to compute the arithmetic average temperature to an accuracy of better than 1% of half the maximum spread in temperature readings. It can be used with any of the common thermocouple alloys, without modification.

Working range is from −70 to 250F, but models are available for higher temperature. The C-1029 comes in two models: One handles five to 20 thermocouples; the other handles five to 30. The device is built to withstand 10G acceleration at 60 cps.

Aero Research Instrument Co., Inc., 1901 North Hermitage Ave., Chicago 22, Ill.

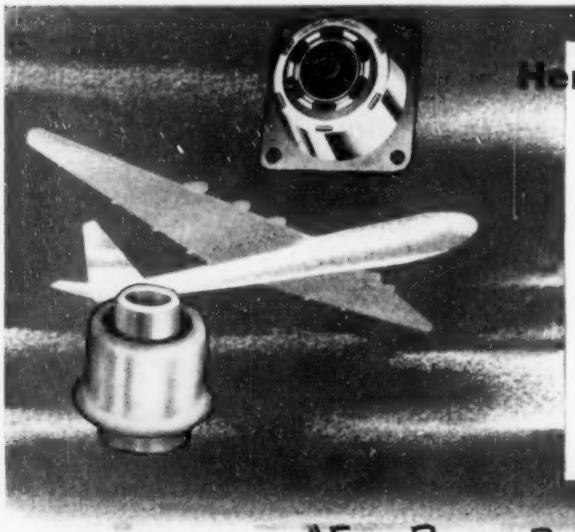


HOLE PUNCHER for use in standard press.

Metal Hole Puncher For Small Runs

Especially designed for low-run production, hole punching unit is designed for installation in a standard press or press brake or can be actuated by an air or hydraulic cylinder. Capable of piercing holes from 3/32-in. to 2¾-in. diameter in up to ¾-in. mild steel, the Quickset Unit has a 24-in. throat depth and is furnished with a 36-in. combination back gage and end stop bar. Back gage and end stop bar slide along a pair of rails which have holes at one-inch intervals and a screw-type adjustment on the C-frame allows for setting up various dimensions.

Toolset Division, General Riveters, Inc., 777 Hertel Ave., Buffalo, N. Y.



Here's Better Vibration Control in Less Weight and Space!

General's unique rubber-to-metal mounts can drastically reduce damaging vibration in aircraft with less weight and space than other types. Our custom engineered Silentbloc units are ideal for mounting aircraft engines, speed rings, cowls and flaps and any other part where vibration is a problem. In addition, General offers special panel mounts for protecting radio, radar, instruments and other delicate apparatus from harmful shock.

We have a successful record in designing and producing products to offset vibration in aircraft. For complete details on our products and services just fill out the coupon below.

"From Plans to Products in Plastics and Rubber"

THE GENERAL TIRE
Industrial Products Division
WABASH INDIANA

The General Tire & Rubber Company
Industrial Products Division
Wabash, Indiana

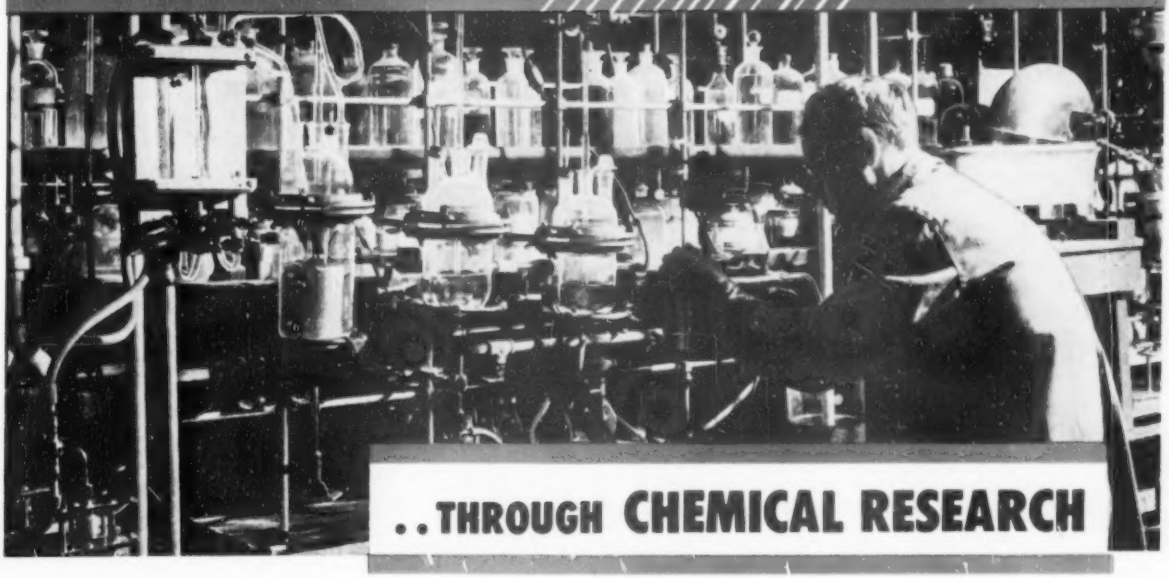
☐ Send literature on your vibration control products and services
☐ Have your representative contact us

Name_____ Company_____

Street_____ City_____ State_____

AW-10-54

SUPERIOR SOLID PROPELLANTS FOR ROCKETS...



..THROUGH CHEMICAL RESEARCH

Solid Propellant Propulsion and Power Units for:

ORD ROCKETS
GUIDED MISSILES
BOOSTERS
GAS GENERATORS
AIRCRAFT ASSIST TAKE-OFF
SHORT DURATION POWER PLANTS

We welcome employment inquiries from engineers interested in the field of rocketry.

Thiokol's development of solid propellants is based on chemical research as the starting point. Intensive investigation of the chemistry in this field has been conducted by the Thiokol Chemical Corporation for many years. These efforts have resulted in improved solid propellants with desirable handling and performance characteristics.

With "Thiokol" solid propellants, simplified power units for field use can be produced economically. These offer the designer a wide degree of flexibility in missile design. The versatility of these units is such that they can be produced to meet widely varied performance requirements. "Thiokol" solid propellants maintain a high standard of performance throughout a broad temperature range.

Chemical research is only one of the many steps in Thiokol's integrated development of solid propellant power units. Other Thiokol activities of equal importance include design, fabrication, developmental testing and manufacture.

Thiokol Chemical Corporation

SYNTHETIC RUBBERS • PLASTICIZERS • CHEMICALS • SOLID PROPELLANTS

784 NORTH CLINTON AVENUE • TRENTON 7, NEW JERSEY

ARO

Variable Speed AIR HOIST

Choice of Controls . . . New Pendant, push-button, instant stop or start, up or down . . . also, double cable control.

Variable Speed . . . 1000 lbs., 0 to 38′ per minute . . . quieter . . . no spark hazard . . . explosion-proof motor.

AIR-powered for Safety . . . can't burn out . . . can't overheat . . . permits continuous use . . . unaffected by dust or fumes.

Lightweight . . . only 28½ lbs.—overall length, 10½″.

SEE YOUR ARO DISTRIBUTOR

THE ARO EQUIPMENT CORPORATION
Bryan and Cleveland, Ohio

Aro Equipment of California, Los Angeles, Calif.
Aro Equipment of Canada, Ltd., Toronto 1, Ontario
Offices in All Principal Cities

ARO AIR HOIST
Also . . . Air Tools . . . Lubricating Equipment . . . Aircraft Products . . . Grease Fittings

READERSHIP: While there are many magazines serving the aviation industry, all with some degree of importance . . . only one, AVIATION WEEK, is universally accepted in terms of *Reader Preference*. Engineers, scientists, management men and Air Force officers . . . government and aeronautical legislative committees . . . aviation writers, columnists, commentators and financial specialists . . . some 50,000 key people in all* . . . read every issue of AVIATION WEEK, absorb its contents, use it, quote it, depend upon the accuracy of its information for their daily needs. The reason for this overwhelming preference for AVIATION WEEK is twofold: 1. A record through the years of "Firsts" in reporting aviation's breathtaking technical progress; 2. The largest, most experienced staff of aviation news and technical experts in the publishing business . . . complemented by a world-wide aviation reporting network. Advertisers demonstrate their recognition of AVIATION WEEK's unequaled impact and readership by consistently placing more advertising in AVIATION WEEK by a huge margin than in any other aviation publication. Aviation advertisers know the value of telling their sales story where it has the greatest acceptance, the best readership, reaches the largest market, and gets maximum results. That is why 608 advertisers placed a record 3,440.29 pages in AVIATION WEEK during 1953 . . . a record being topped substantially in 1954.

*Current print order 52,785
Latest ABC 47,327
net paid 6/30/54

McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42 STREET, NEW YORK 36, N. Y.
Other Advertising Sales Offices: Atlanta 3, Ga., 801 Rhodes-Haverty Bldg. Boston 16, Mass., 350 Park Square Bldg. Chicago 11, Ill., 520 N. Michigan Ave. Cleveland 15, Ohio, 1510 Hanna Bldg. Dallas 1, Tex., First National Bank Bldg. Detroit 26, Mich., 856 Penobscot Bldg. London E. C. 4, England, 95 Farringdon Street. Los Angeles 17, Calif., 1111 Wilshire Blvd. Pittsburgh 22, Pa., 738-9 Oliver Bldg. Philadelphia 3, Pa., 17th and Sansom Streets. San Francisco 4, Calif., 68 Post Street. St. Louis 8, Mo., Continental Bldg. Member ABC ABP

IS THE DATA VALID?

The moment an oscillograph is taken out of the laboratory for aircraft flight testing, vehicle road tests, or any application where vibration and dynamic g forces are present, the "balance" of its galvanometers—the measure of their response to gravitational force—becomes all-important. An unbalanced galvanometer can cause deflections—under only moderate g-loadings—large enough to distort a data trace and make accurate record interpretation impossible. It can show deflections even when no data signal is present.

Miller Instruments' *improved* galvanometers are supplied *at no extra cost* with balance so closely controlled that trace deflection is within 0.010" per g in elements of less than 300 cps natural frequency and within 0.001" per g for higher frequencies. The unique open construction allows balancing to be the *final* operation before shipment. No subsequent assembly steps disturb the balance achieved. Trace deflection due to g forces displacing the suspension is negligible.

Sound basic concept and extreme care in manufacturing and testing make Miller Galvanometers unequalled not only in their balance but also in their control of sensitivity, linearity and stability. Inaccuracies have been literally "designed out." The unusual fineness of the traces they produce have long been the standard in oscillographic recording. Available with natural frequencies from 35 to 3200 cps and a wide range of sensitivities, Miller Galvanometers are described in detailed literature, which will be sent on request.

WM PASADENA

WM MILLER INSTRUMENTS, INC.

CUSTOM INSTRUMENT DESIGNERS AND MANUFACTURERS

325 N. HALSTEAD AVENUE • PASADENA 8, CALIF. • RYAN 1-8317

OVERSEAS SPOTLIGHT

Copter for Businessmen

ROME

A two-place helicopter, aimed at the business market, has been designed and tested by Eng. Lualdi here. Construction has been kept simple and weight low. Price is expected to be below that of similar types.

Labeled the Lualdi E. S. 53, the craft has an 85-hp. Continental engine designed to give it about a 68-mph. top speed, and a cruising range of 155 mi. An improved model, which Luadi hopes to mass-produce, will be somewhat heavier, have a 125-hp. or 140-hp. engine, and 225-mi. range at cruising speed.

Japs Make Douglas Deal

TOKYO

The C. Itoh Co., Ltd., has gained the franchise to deal in all Douglas Aircraft Co. products for non-commercial use in Japan. The company is Douglas's sole agent in Japan.

As a result of the agreement, Japan will be in a position to get up-to-date U. S. air weapons, if the American government approves, says the Itoh company. Details of the pact were not revealed.

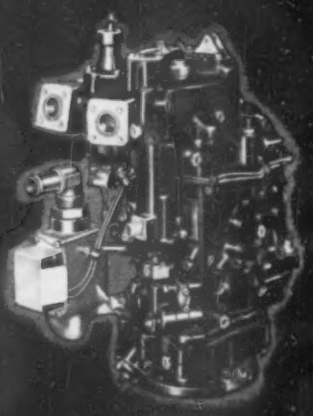
Cash for DC-6s

MANILA

Philippine Air Lines' stockholders will share a $2-million melon in the near future.

The money became available when the airline sold all of its four-engine planes (two DC-6s and two DC-6Bs, plus spares, for $6,350,000) after suspension of its long-range international services. The board of directors there-

Right from the START !



Engine Thrust depends on fuel controls! Since the beginnings of the jet age, CECO jet engine fuel controls have helped to propel America's most advanced aircraft . . . **up faster . . . out farther** . . . in the race for world air supremacy. Today, more than 27,000 controls later, they're still proving their superiority . . . still aiding the free world's finest jets — like the F-86H Sabre — to achieve new performance records.

Ask our engineering-production teams to turn your plans into practical realities. They have done so for others!

CECO

CHANDLER-EVANS

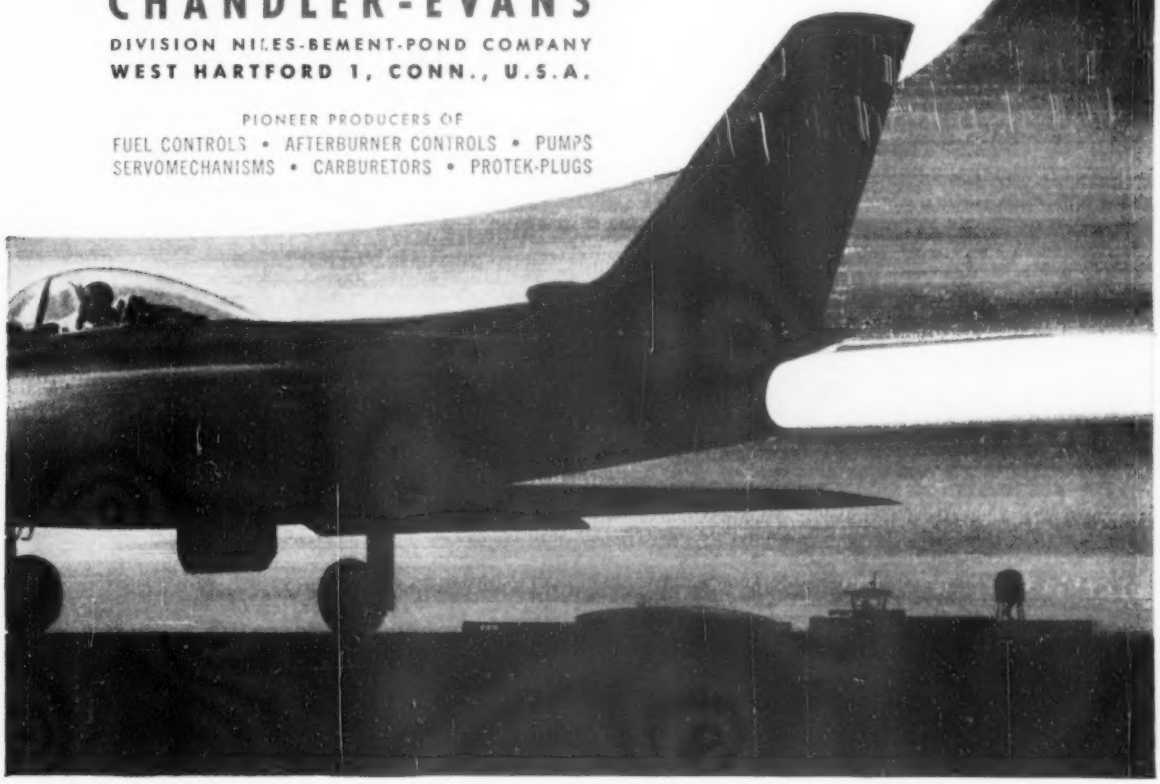
DIVISION NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONN., U.S.A.

PIONEER PRODUCERS OF

FUEL CONTROLS • AFTERBURNER CONTROLS • PUMPS

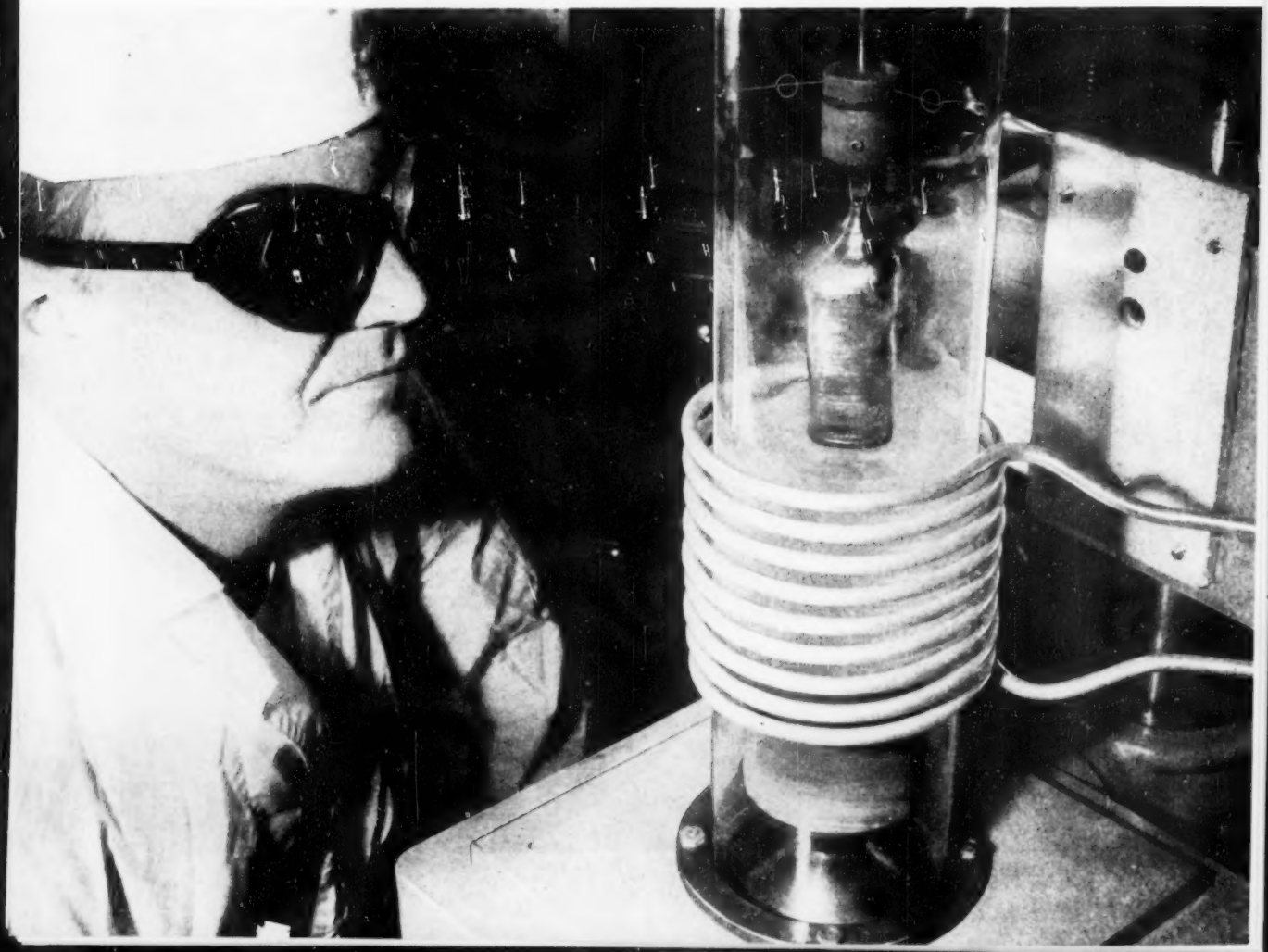
SERVOMECHANISMS • CARBURETORS • PROTEK-PLUGS

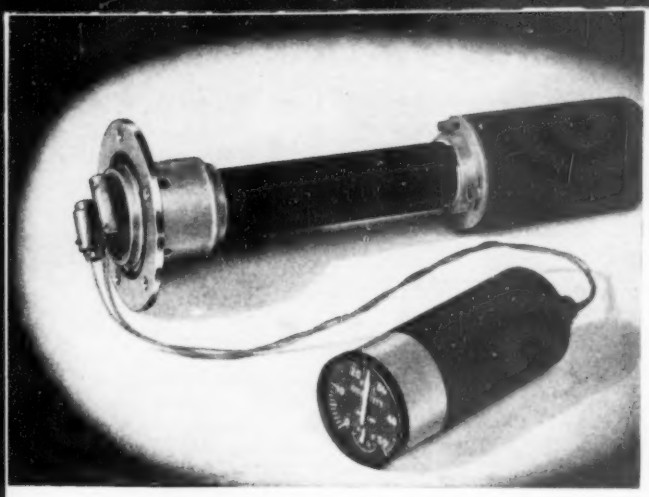


More accurate, more reliable fuel measurement system from Honeywell

FIRST TRANSISTOR FUEL GAGE FOR AIRCRAFT !

"Growing" germanium in an induction furnace for use in Honeywell transistors. Of all the U. S. companies working on transistors, only Honeywell has developed a production transistor with power enough for fuel gage use.





Smaller in size, lighter in weight. This is a picture of a production model of the new Honeywell Transistor Fuel Gage. Note that it's made up of only two elements – a combined indicator-amplifier located on instrument panel and a tank element in the fuel cell.

Transistors of up to 20 watt power are now in production at Honeywell's Transistor Division. The units are produced in air locked rooms under dust-free, constant climate conditions. Many skilled technicians help make possible the high reliability and uniformity of Honeywell transistors.

NOW in production, the first completely transistorized fuel gage system offers striking advantages over former models.

Because transistors are small and require little power, the new gage is smaller, lighter and draws less power than the models it replaces.

Transistors are extremely long-lived, shock and vibration resistant. As a result the new gage is more reliable than any previous models.

These same characteristics mean that the transistors do not have to be easily accessible. In the new gage they are hermetically sealed behind the indicator. This eliminates tube inventories and reduces servicing. Designed to meet all applicable military specifications, the gage operates from minus 65° to 160° F.

Another development from Honeywell

In the newly-designed gage *all* electron tubes have been replaced by transistors. The Transistor Fuel Gage is the latest model in the Honeywell line of fuel measurement systems. Various models of the Honeywell gage are flying today on over 80 different types of military aircraft. They are going into every type of U. S. commercial transport plane now in production.

If you would like full details on the new Honeywell Transistor Fuel Gage, write us on your business letterhead at the address below.

Controls for everything that flies

We believe our contribution to America's position in the air rests on two special abilities: The ability to *design* the increasingly complex control systems which today's aircraft require. And the ability to *produce* these systems in quantity – on a basis of interchangeability of components which saves money for airframe and engine manufacturers, the armed services, and American taxpayers.

In our 500,000 square feet of plant space, 5,000 engineers, researchers, technicians, and skilled craftsmen work at producing fine Honeywell Airborne Controls and devising even better ones. We would like to put this pool of skill to work for you.

Besides the new Transistor Fuel Gage, Honeywell produces a complete line of gyros for stabilization, fire control, aircraft control, and missile guidance . . . electronic autopilots for helicopters and fixed-wing craft . . . jet engine controls . . . power controls . . . synchronous vibrators . . . actuators . . . amplifiers . . . valves and switches.

MINNEAPOLIS

Honeywell

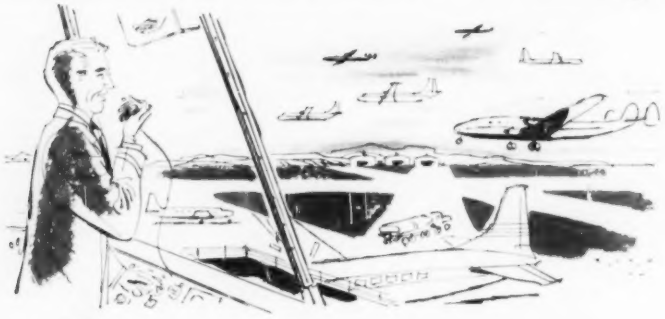
Aeronautical Division

2600 Ridgway Road, Minneapolis 13, Minnesota

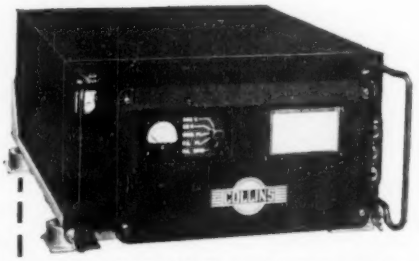
For the best in high frequency communications

COLLINS

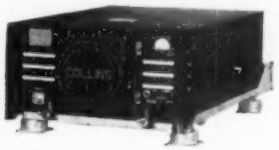
618S Transceiver with the 180-L automatic antenna tuning unit



FOR MANY YEARS the Collins designed AN/ART-13 was *the* outstanding HF Transmitter in aviation — commercial and military, domestic and international.
After the ART-13 came the Collins 18S HF Transmitter-Receiver. In incorporating the same quality features and advanced design detail as the ART-13, the 18S series has served the industry well and has been accepted universally by the commercial and military operators.
Now the 618S Transceiver, featuring 144 channels, 100 watts, modular construction incorporating mechanical filters and crystal saving circuits is taking its place in the Collins line of HF equipment. Already purchased and in service by many of the great airlines of the world, this transceiver has now been accepted by the Air Force and is being acquired for use in their global operations.
The 618S with the 180-L is proving again Collins leadership in the HF field.

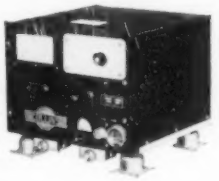


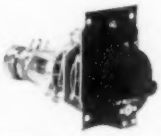
Collins 618S 144 Channel HF Transceiver for all purpose air-borne communications.



Collins 18S 20 Channel HF Transceiver.

Collins 180L-2 Automatic Antenna Tuning Unit for use with 618S or 18S. Makes all antenna adjustments automatically.





Collins 614D Frequency Control Unit for use with the 618S Transceiver.

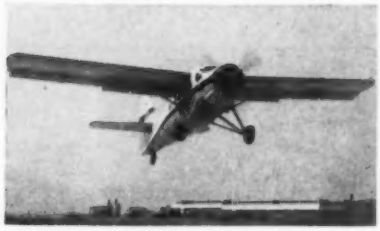
Shockmounts

350S-1 Shock feet for air-borne or mobile installations.
350S-2 No shock feet. Designed for shock mounted shelf.

COLLINS RADIO COMPANY CEDAR RAPIDS, IOWA

261 Madison Ave., NEW YORK 16
1930 Hi-Line Drive, DALLAS 2
2700 W. Olive Ave., BURBANK
Collins Radio Company of Canada, Ltd., 74 Sparks St., OTTAWA, ONT.

COLLINS



AIRBORNE OTTER—De Havilland Otter, big brother to the company's L-20 Beaver, is competing against helicopters for Canadian Army consideration as a liaison-ambulance-cargo carrier. The Otter can carry a 2,700-lb. payload. Used as an ambulance plane, it carries six litters plus three seats for walking wounded. Cruise speed is 138 mph., but the plane can be slowed to 40 mph. for paradrops.

upon voted to reduce the airline's capitalization from $6,250,000 to $4 million, withdrawing 450,000 of the company's 1,250,000 outstanding shares of stock. It is this capital surplus of more than $2 million that will be distributed.

The company's directors expressed the belief that $4 million in fully paid-up capital is more than enough to enable the airline to carry out its present activities and still leave allowance for expansion.

Venezuela Modernizes

CARACAS

Venezuela's Ministry of Communications is spending $9 million on improving facilities at 47 of the nation's airports. First phase of the program, to be completed in December, includes modernization of air traffic control equipment at Maiquetia, airport for Caracas.

The entire program is to be completed in four years.

Civil Flyers Get Help

JOHANNESBURG

The South African government has adopted a scheme to subsidize civilian flying to the extent of $70,000 a year.

The government will allow up to $168 toward the expense of obtaining a private pilot's license; renewal of the license will be subsidized to the extent of $56.

To encourage flight training institutions to offer training facilities to less densely populated areas, the government will subsidize the ferrying of training aircraft to the extent of 7 cents a mile.

Approved gliding clubs will also get a government subsidy.

THE NEW MS SERIES BY BRILES

MIL-B-7838 SPECIFICATION FEATURES

1—Rolling Fillets and Threads After Heat Treat . . . (Increases Strength Through Elongated Grain Flow)

2—160,000 to 180,000 PSI to Withstand An Average of 65,000 Fatigue Cycles

3—100% Magnetic Inspection

As a pioneer producer of precision fasteners for the Aircraft industry exclusively, Briles specialized experience in cold heading and thread rolling gives the industry fasteners of the highest quality on a production basis.

BRILES MANUFACTURING COMPANY

COLD HEADED RIVETS AND BOLTS
3 32° to 1 1/2" Dia.
EL SEGUNDO, CALIFORNIA

To be sure you're getting top quality lightweight castings, you'll want to look for:

- An experienced manufacturer
- A product made under close laboratory control and inspection
- Competent designers to work with your engineers
- A wide range of specifications and alloys
- Production economy

And you won't have to look far . . . just get in touch with WELLMAN. We'll be happy to help you with your castings problem.

Catalog No. 53 on request.

Well-Cast MAGNESIUM, ALUMINUM AND BRONZE CASTINGS
Well-Made WOOD AND METAL PATTERNS

THE WELLMAN BRONZE & ALUMINUM CO.
Dept. 5, 12800 Shaker Boulevard Cleveland 20, Ohio

WHAT'S NEW

Telling the Market

Two-lever coordination control unit used in safety, control and operating devices for pneumatically operated equipment and processes is detailed in Bulletin 68123 from Pantex Mfg. Corp., P. O. Box 660, Pawtucket, R. I. . . . Series R Diaform **wheel forming attachment** for cutter relief angle compensation when grinding tools is described in folder available from Pratt & Whitney, W. Hartford 1, Conn.

Variable-delivery hydraulic pumps (66W series) for 3,000-psi. operation with rated capacities of 2-10 gpm. are described in brochure available from Watertown Division, N. Y. Air Brake Co., Starbuck Ave., Watertown, N. Y. . . . **Vibration and Shock Control Trends** is a new series of technical bulletins issued semi-monthly dealing with advanced developments. Available free from Robinson Aviation, Inc., Teterboro, N. J. . . . **Industrial ovens,** their applications, source of heat, election of heaters, control and distribution of heat, are detailed in Bulletin D-53-20 being distributed by Newcomb-Detroit Co., 5741 Russell St., Detroit, Mich.

Steel casting manufacture is detailed in 32-page brochure obtainable by writing on company letterhead to William H. Worrilow, Jr., general sales manager, Lebanon Steel Foundry, 63 Lehman St., Lebanon, Pa. . . . New 16-page Catalog 1024B describes **internal and universal hydraulic grinder** manufactured by Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass. . . . Four-page bulletin on the Model S-216-C series of **air-driven, high-pressure hydraulic pumps** is offered by Sprague Engineering & Sales Corp., Gardena, Calif.

A series of data sheets concerning circuit selection and snap action problems is being published under the name of **Ledex Engineering Sketchbook.** The sheets, which include product information, applications and schematic diagrams, are issued approximately once a month. Engineers will be put on the company's mailing list on request to G. H. Leland, Inc., Dayton 2.

Publication Received

• **Skyrocketing Into the Unknown,** by Charles Coombs, pub. by William Morrow and Co., 425 Fourth Ave., New York 16, N. Y.; 256 pp., $4.00. Pictures and words about jets and rockets.

• **Determination of Accelerative Forces Acting on Man in Flight and on the Human Centrifuge,** Report by Dixon and Patterson, Project NM 001 059.04.01, for U. S. Naval School of Aviation Medicine, 225 pp.

SOUND ASSEMBLY

Side by side, they roll off the Fairchild production lines – the famed C-119 *Flying Boxcar* and its new assembly line mate, the C-123 *Avitruc*.

Only Fairchild know-how could have accomplished the swift, sure integration of C-123 production into the C-119 assembly pattern . . . without missing a beat!

The two aircraft make a perfectly matched team of assault transports, created for the single purpose of concentrating maximum numbers of men, machines and equipment in a given area, in the shortest time possible.

It seems altogether fitting that these ultimate developments in assault transports should roll wing to wing from the assembly lines of Fairchild – pioneer in the field of military air transportation.

ENGINE AND AIRPLANE CORPORATION

FAIRCHILD

Aircraft Division

HAGERSTOWN, MARYLAND

Other Divisions:

American Helicopter Division, Manhattan Beach, California

Engine Division, Farmingdale, N.Y.

Guided Missiles Division, Wyandanch, N.Y.

Stratos Division, Bay Shore, N.Y.

Speed Control Division, Wickliffe, Ohio

NEW HORIZONS IN ENGINEERING

Hotter "Hot end" components

Jet engine performance is measured in terms of "specifics". "Specific thrust" is pounds of thrust per pound of air per second. "Specific weight" is pounds of engine weight per pound of thrust. The goal is always more and more thrust for less and less weight.

In this quest, the ability to produce higher "specific thrusts" at lower "specific weights" depends on the ability to handle ever-increasing temperatures, and is therefore a direct measure of the success of new designs. To this end, the ingenuity of engineers and metallurgists is constantly taxed to achieve durability at higher temperatures through better design and better materials.

Jet engine "hot end" components and other complex fabricating problems are not new to I-T-E's Special Products Division. Its engineers and production men have specialized in solving the problems involved in tooling for and producing "hot end" components of hard-to-work alloys in complex designs.

Perhaps these men can help you with your problems.

Why not send for Publication SP-100 A-10 today. It shows what has been done to help others.

RADAR ANTENNA SYSTEMS
design, development and fabrication

JET ENGINES
manufacture of major hot-end components

THERMODYNAMICS
design, development and fabrication of equipment to operate on advanced theories

GUIDED MISSILES
advanced fabricating techniques

TITANIUM
proven welding, forging, forming, spinning techniques with this hard-to-work metal

SPINNING
combining spinning and drawing to an almost limitless variety of designs in a wide range of metals

TECHNOLOGY
ABILITY
FACILITIES

SPECIAL PRODUCTS DIVISION

I-T-E CIRCUIT BREAKER COMPANY

601 East Erie Avenue • Philadelphia 34, Pa.

Progress through Problem Solutions

SP 10.5

Lufthansa May Get Wings Early Next Year

- **Nine-power pact seen as paving way for Germany's 'paper' airline to open routes to five countries.**
- **Carrier plans to start trans-Atlantic flights as soon as four Super Connies on order are delivered.**

By Frank Shea, Jr.

Paris—It now appears certain that Lufthansa, the German airline with no airplanes, soon will be able to take delivery on equipment and commence operations early in 1955.

Recent signing of the nine-power agreement at London was the turning point, not only for Lufthansa but for West Germany as a whole (see p. 15). Calling for rapid restoration of West Germany sovereignty, it paves the way for removal of the major stumbling block to the carrier's transition from a "paper" airline to full-scale operations.

Although not clearly spelled out in the pact, civil air sovereignty is expected to follow governmental sovereignty.

▶ **French Barrier**—Up to now, Lufthansa has been denied the right to own or operate aircraft pending ratification of the European Defense Community. The Allies had agreed to restore German air sovereignty 27 months ago in the Allied-West German peace contract, but this contract was held up by France's continued failure to ratify EDC.

After the French Parliament in effect killed EDC, the question of German air sovereignty looked blacker than ever and West Germany's Federal Transport Minister Hans Seebohm pressed for special permission to begin airline operations without ratification.

Thus, when things looked blackest for Lufthansa, the unexpected news of the nine-power accord in London was considered a lifesaver by German airline supporters. They feel certain that the way has been paved at last for the re-emergence of their airline into international competition.

▶ **Early Start**—If air sovereignty is granted this fall, Lufthansa will be ready to begin operations to Britain, France, Switzerland and Spain within the first few months of next year, a company spokesman told AVIATION WEEK here.

Four U. S. Convair 340s are slated for November delivery for the European routes, with May 1955 delivery of four Lockheed 1049E Super Constellations expected for trans-Atlantic service between Hamburg and New York.

The Germans hope eventually to revive all prewar Lufthansa routes outside the Iron Curtain. After European and trans-Atlantic flights are started, they plan to establish routes to the Middle East, South America and through the Far East to Tokyo.

Lufthansa will be unable to fly to Berlin, its prewar headquarters and principal terminal, so long as the former capital is surrounded by the Russians. The postwar four-power agreement restricts Berlin flights to planes of the four occupying powers.

▶ **25-Plane Fleet**—Under present plans, the initial fleet of eight U. S.-manufactured planes will be increased to 20 or 25.

The prewar Lufthansa had 150 aircraft, mainly three-engine Junker 52s. But officials estimate that 25 modern airliners will have the same carrying capacity as the entire prewar fleet.

Pending the training of a sufficient number of German pilots, foreign pilots will captain Lufthansa aircraft, with Germans in the co-pilot's seat. A group of Lufthansa pilots and flight engineers currently is being trained in the U. S. by Convair and Transocean Air Lines.

German Tour

Several German aviation officials recently completed a visit to the U. S. as guests of the scheduled airlines in cooperation with the State Department.

Purpose of their visit was to study operational and maintenance techniques of U. S. carriers and apply them to German civil aviation operations. Their trip took them throughout the country to airline maintenance and overhaul bases and general offices. With the blessing of Civil Aeronautics Board, they were flown over as the guests of Pan American World Airways and returned as guests of Trans World Airlines.

The party included Dr. Kurt Knipfer, chief of civil aviation of the German Federal Republic, and Dr. Fritz-Ulrich Schmidt-Ott, chief of the International Section.

▶ **Competitor Concern**—Although most international airlines admittedly are concerned over the increased competition that will be brought about by the Lufthansa revival, German officials believe the airline will not be in a position to compete seriously with other carriers for at least four to five years.

They note that Swissair, the smallest European carrier, has 24 aircraft and that it will take them several years to build up to even this size.

To date, Lufthansa has not indicated the type aircraft planned to fill out the remainder of its fleet. Indications are that a substantial number of these planes will be made up of additional 340s and Super Connies, but the carrier may supplement these with still another type.

▶ **Substantial Backing**—Financing seems to be no problem, since both government and wealthy German industrial interests are anxious to see their national airline in a position of world prominence again, and are willing to spend any amount of money necessary to accomplish this end.

The company bought its Convairs for $650,000 each, plus 40% of the unit cost for parts and spares. They paid $1.7 million each for the Connies, also with 40% added for parts and spares. An additional 15% of unit cost on the Connies was paid for special Lufthansa installations.

The carrier was supposed to have taken delivery on at least two of its Convairs earlier this year, but was unable to accept them because of the unsettled political situation (AVIATION WEEK May 17, p 16; Aug. 23, p. 22).

While exact financing terms have not been revealed, it is understood that payments to both Convair and Lockheed are to be made in U. S. dollars.

▶ **Transportation Hub**—With Berlin, its former headquarters, out of the question, Lufthansa plans to maintain its present general offices at Cologne. This is about as central a location in West Germany as Berlin was in the undivided prewar Germany.

The airline's home base, including all maintenance and training facilities, will be at Hamburg. The Hamburg city government has appropriated $840,000 for construction of necessary buildings and installations.

Location of Lufthansa there will mark Hamburg as the transportation hub of the new Germany, since already it is long established as a leading shipping center.

MAASTRICHT HELIPORT is in center of Dutch town near river used for copter's approach.

BRUSSELS' HELIPORT: S-55 leaves for Rotterdam; another gets set to go to Cologne.

Report on Sabena

Copters Need New Traffic System

By Robert Hotz

Brussels—A new type of airway and traffic control system must be developed for transport helicopter operations to realize their full potential, A. V. J. Vernieuwe, operations manager and pioneer helicopter pilot of Sabena Belgian Airlines, told AVIATION WEEK.

As a result of five years' experience in operating mail and transport helicopter services with American-built Bell and Sikorsky helicopters, Vernieuwe believes copter traffic control and en route operations must be completely divorced from the patterns established for fixed-wing aircraft for the successful development of new rotary-wing transport services.

"You can't treat the helicopter like an airplane and be successful," Vernieuwe said. "You must treat it more like a bus."

▶**Future System**—The helicopter airway and traffic control system of the future should be based on the following key features, according to Vernieuwe:

- Use of airspace up to maximum altitude of 1,000 ft.
- Use of one-mile lateral separation for traffic, instead of the altitude separation technique of fixed-wing operations.
- Use of British low-frequency Decca navigations system as a primary aid for instrument flight along airways.
- Use of lightweight airborne radar and ground radar beacons as secondary navigation aids.

There is strong interest among transport helicopter operators both in Europe and the United States in the special lightweight Decca cockpit installation, developed especially for helicopter use. British European Airways has been testing this device in a Bristol Sycamore helicopter for several years. It is expected to offer accuracy of ground position within 100 yd.

Airborne radar for helicopters would use three-centimeter wave length and be scaled for five-mile coverage during en route operations and one-mile radius for terminal approaches.

▶**GCA Tests**—Sabena uses VHF/DF equipment and an ordinary road map for its operations, now restricted to visual flight rules with minimums of 400 ft. ceiling and 800 yd. visibility. Sabena helicopter pilots have experimented with instrument flight successfully and executed GCA landings with 50-ft. ceilings.

For heliports and airway intersections, Vernieuwe believes radar beacons will be the answer. The blip of the radar beacon in the airborne scope will give the copter pilot pinpoint accuracy for his letdown. At airway intersections Vernieuwe proposed installation of radar beacons at a reasonable distance on each side of the intersecting airway.

When a copter approaches the first beacon, it will climb 500 ft. over the other airway, cruise until the second beacon registers, then let down to normal airway altitude and continue on.

With airborne radar of five-mile range, Vernieuwe believes helicopters will be able to spot other air traffic at distances sufficient to maintain one-mile lateral separation.

▶**All-Weather Goal**—Although experimental instrument operations are possible with single-engine helicopter equipment, Vernieuwe believes regular transport operations under instrument conditions must await the arrival of twin-engine equipment offering single-engine climb performance at 35 knots.

Because of its ability to alter speed in relation to visibility conditions, Vernieuwe believes the copter will reach the goal of genuine all-weather operations long before fixed-wing aircraft.

Sabena now has a total of 11,700 hr. of helicopter operations, of which 5,800 hr. were on Bell machines and 6,000 hr. on Sikorsky S-55s.

During the past year, more than 200 foreign airline personnel have visited Sabena and studied its transport operations.

The airline has been making its technical data available to other European operators who plan to enter the helicopter field in the future, including British European Airways, KLM Royal Dutch Airlines, and Air France.

▶**Copter Experience**—Here are some of the highlights of Sabena's experience during its first year of transport copter operations:

Heliports. Sabena believes the downtown heliport is the key to transport operations. It has successfully negotiated with municipal governments in four countries for downtown sites in eight cities. With the exception of Sabena's home heliport in downtown Brussels, the other installations have been built and paid for by the local governments. In all cases, the sites offer an approach over a river or an unpopulated area.

Sabena has developed a standard plan for a heliport building modeled on its

Sabena Copter Net

From Brussels to:	Flying time*	Fare**
Antwerp	20 min.	$5.40
Bonn	1 hr. 55 min.	18.80
Cologne	1 hr. 35 min.	16.10
Liege	40 min.	9.80
Lille	55 min.	10.70
Maastricht	50 min.	9.80
Rotterdam	1 hr. 5 min.	12.50

* One way
** Roundtrip

Brussels installation, including post office, customs and immigration posts and automatic insurance machines where passengers can buy $6,000 worth of insurance for every $1.20 up to a maximum of $120,000. Sabena keeps only one man to operate the heliport.

The current eight heliports are connected by radio and a teletype that provides current weather and traffic data. Landing pads and taxi strips are built of various materials, including brick, pierced steel strips and asphalt.

Passengers. Sabena asks every passenger to fill out a questionnaire written in four languages on details of their reactions to the helicopter operation. First year's returns showed 99% liked their ride. Main reasons were:

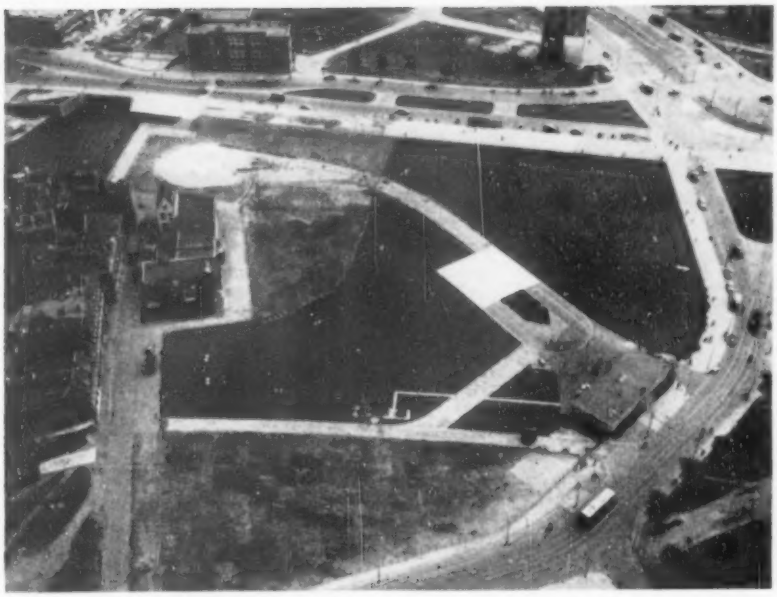
- Visual flight conditions. Passengers like to watch the countryside unfold below them.
- Flying low for the same reason of good visibility.
- Passengers apparently got a feeling of greater safety from the relatively slow cruising and approach speeds.

Sabena makes a studied attempt to impress its passengers with the advantages of helicopter travel. Phones connect the pilot with passengers in the cabin. The pilots take great delight in pointing out to passengers when they pass an express train en route to their destination or a border control station with cars jammed up along the highway waiting to pass through customs and immigration.

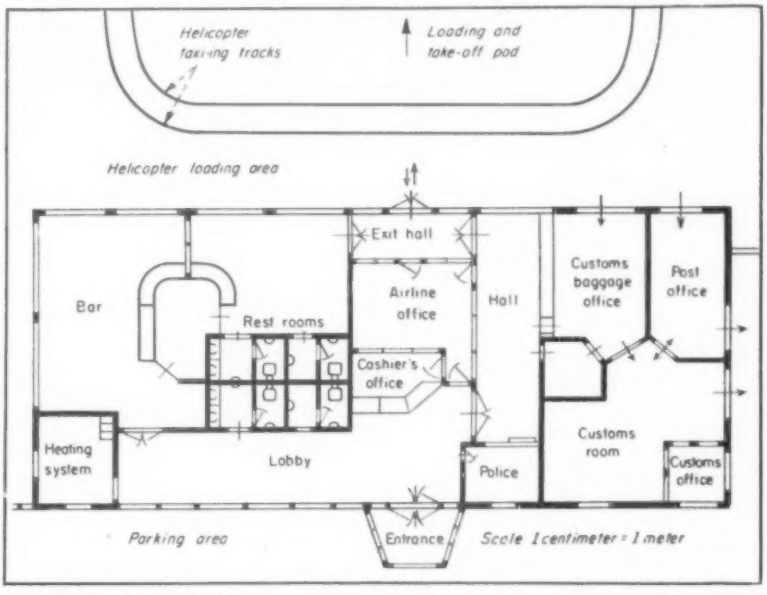
On the ground, the heliports draw sizeable crowds at the time of arrivals and departure, and Sabena pilots usually oblige with a performance designed to demonstrate the unique qualities of the helicopter—hopping over a parked helicopter to reach the loading ramp, carefully skirting the inside perimeter of the field at five-foot altitude and backing up to the extreme boundary of the field only a few feet off the ground to make the takeoff run into the wind.

Passengers connecting with Sabena flights at Melsbroek have baggage allowances for their copter flight equal to that on the type of fixed-wing service they are using.

Sabena makes a great point of prompt



ROTTERDAM HELIPORT has typically handy location adjacent to surface transportation.



STANDARD FLOOR PLAN is used by Sabena for the airline's various downtown heliports.

helicopter connections with their long-range services to North America, Africa and southern Europe and will hold helicopters at Melsbroek for passengers arriving on planes for destinations on the copter network. Helicopter passengers are not required to clear customs or immigrations at Melsbroek.

Maintenance. Sabena averaged 1,750 hr. of flying for each of its four Sikorsky S-55s during its first year of transport operations. Since operations were restricted to VFR daylight conditions, maintenance schedules were organized for night work at Sabena's main Melsbroek Airport shops.

Flying eight roundtrip passenger schedules daily with an additional mail circuit requires three S-55s, with the fourth available as a standby.

Sabena uses the American Civil Aeronautics Administration-prescribed system for progressive maintenance with checks of increasing scope at 15, 50 and 150 hr. up to a complete overhaul at 1,200 hr.

The rotor blades are changed at 1,800 hr., rotor heads and gear boxes at 360 hr. and the Pratt & Whitney Aircraft R1340 Wasp engines at 500 hr.

(This is the second of two articles by Robert Hotz on Sabena operations.)

Why Be Half Safe?

LONDON—British Overseas Airways Corp. pilots engaged in flying aircraft carrying livestock have been awarded additional compensation payment of seven shillings per hour by Britain's industrial court.

In appealing for a boost of £1 per hour for the pilots, British Air Line Pilots Assn. claimed these men are the "Cinderellas of their profession."

The association said the claim concerned the occasions when the pilots are flying York aircraft with freight consisting of animals, mostly monkeys. They noted that pilots have been operating these obsolescent planes so long that they see their chances of transfer to other fleets being lost.

It was further noted that these men have none of the amenities on board which are common to pilots operating passenger-type aircraft, adding that "it is not unusual for them to act as animal keepers and they work in hot climates."

Their meals are taken in "degrading and obnoxious conditions," the association said.

They claim their bodies are contaminated by the ever-present smell of animals to the extent that "when they come in contact with their fellow men they are shunned."

BOAC argument was that livestock freight is desirable business, usually secured in the face of keen competition. The carrier stated that costs "had to be kept to a minimum."

The company agreed that the job is less pleasant than others, but contended that it is reasonable and proper for the corporation to accept the loads.

It was stated further that there is no known cause of a pilot being injured through carrying livestock and losing his license as a result. It also was noted that there is no special risk to health. —FS

British Await Comet Investigation Results

London—The stage is set for an official inquiry Oct. 19 into the two Mediterranean crashes of British Overseas Airways Corp. Comet 1s.

At this point, outcome of all investigations is a well-kept secret and it is considered extremely doubtful that anything specific will come out until after the court of inquiry meets (AVIATION WEEK Oct. 4, p. 79).

However, belief that the investigations have been decisive is supported by Supply Minister Duncan Sandys' recent statement that tests made by the Royal Aircraft Establishment and de Havilland have yielded "clear and positive" results.

For the inquiry, the Lord Chancellor, Lord Simonds, has appointed three assessors to assist Lord Cohen, who will preside over the court. They are Sir William Scott Farren, Prof. William Jolly Duncan and Air Commodore Allen Henry Wheeler.

Sir William Farren is technical director of A. V. Roe & Co., Ltd. He was director of the Royal Aircraft Establishment four years during World War II and currently is president of the Royal Aeronautical Society.

Prof. Duncan, an expert on aeronautical engineering and fluid mechanics, is affiliated with Glasgow University. A member of the Aeronautical Research Council, he formerly was professor of aerodynamics in the College of Aeronautics, Cranfield.

Commodore Wheeler is commanding officer of the Aeroplane and Armament Experimental Establishment at Boscombe Down, Wiltshire. He formerly was Air Commanding Officer, Cyprus, and earlier was in charge of experimental flying at the Royal Aircraft Establishment.

Sabena Calls IATA Fare Cut Too Steep

Reduction of tourist fares by International Air Transport Assn. were criticized sharply by Sabena Belgian Airlines last week as too steep and probably too early.

The criticism was made in Sabena's annual report for 1953.

Sabena directors find that while traffic increases are due largely to lower tourist fares and expansion of aircoach services, the added business has not been enough to make up for the decrease in income per passenger.

▶ **Fare War Risk**—North Atlantic traffic showed an increase of 46.4% in 1953, and Sabena seems satisfied with coach service over that route. The main quarrel is with IATA's decision to extend the low-fare services to European and African routes.

The report complains that the company has no control over such decisions and cannot run against the wishes of the majority without risking a fare war.

Sabena also finds that the increase in tourist business has caused seasonal fluctuation in traffic and a corresponding instability in finances.

▶ **$460,000 Loss**—Operations for 1953 netted $32,620,000, but expenditures totaled $33,080,000. The company has applied for a $472,400 credit from the Belgian government to make up the deficit.

The Belgian airline carried 375,000 passengers in 1953, an increase of 35.4% over 1952.

SHORTLINES

▶ **Air Transport Assn.** reports an 18.86% increase in scheduled inter-airline business in August 1954, compared with August 1953. Clearing house transactions totaled $42,674,979.52, compared with $35,904,699.63.

▶ **Allegheny and Capital Airlines** are launching a cooperative advertising campaign to promote interline business. Ads placed in 18 communities on Allegheny's system will feature connecting services of both lines at Pittsburgh, Cleveland and Washington gateways.

▶ **Avianca,** Colombian airline, has expanded Panama service to include Bogota and replaced DC-3s with DC-4s on the Bogota-Medellin-Panama run.

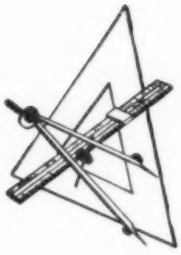
▶ **British Overseas Airways Corp.** will adopt a "BOAC budget plan" Nov. 1 to join the parade of fly-now-pay-later schemes. The plan applies only to sales originating in the U. S., requires 10% down and allows up to 20 months for payment . . . BOAC plans a heavy schedule of winter flights from New York and Miami to Bermuda, Nassau, Jamaica and other Caribbean resorts.

▶ **International Civil Aviation Organization's** Legal Committee has drawn up a convention applying to liability for damage in aircraft collisions. Draft rules apply to all collisions between moving aircraft, provide a limitation of liability and specify that the operator is liable only when the accident is proved to be his fault or that of his employes.

▶ **KLM Royal Dutch Airlines** received its 11th Inter-American Aviation Safety Award for the 1953 operations of its West Indies Division. Nearly 44 million passenger-miles were flown during the period . . . KLM has opened a new office in Seattle.

▶ **Port of New York Authority** sources say the Whiting Corp. is bearing full cost of installing a Whiting Lodair passenger and cargo loading station (AVIATION WEEK Sept. 27, p. 7) at New York International Airport, estimated to be in the neighborhood of $100,000. Whiting also assumes complete responsibility for operating and maintaining the equipment, according to these sources.

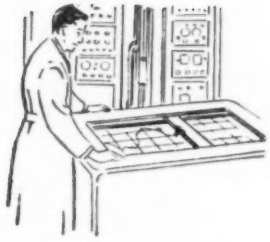
Help Build Tomorrow's World TODAY!



GOODYEAR AIRCRAFT CORPORATION, pioneer and leader in lighter-than-air craft, offers you a new employment opportunity with a well-established and fast-growing company where "careers are planned."

DESIGN AND DEVELOPMENT engineering opportunities are available for capable and imaginative men and women in the field of airships, aircraft and aircraft components.

RESEARCH AND DEVELOPMENT projects — missiles, electric and electronics systems, servomechanisms, new special devices, fiber resin laminates — all present an urgent need for engineers with fresh talent, aptitude and ambition.



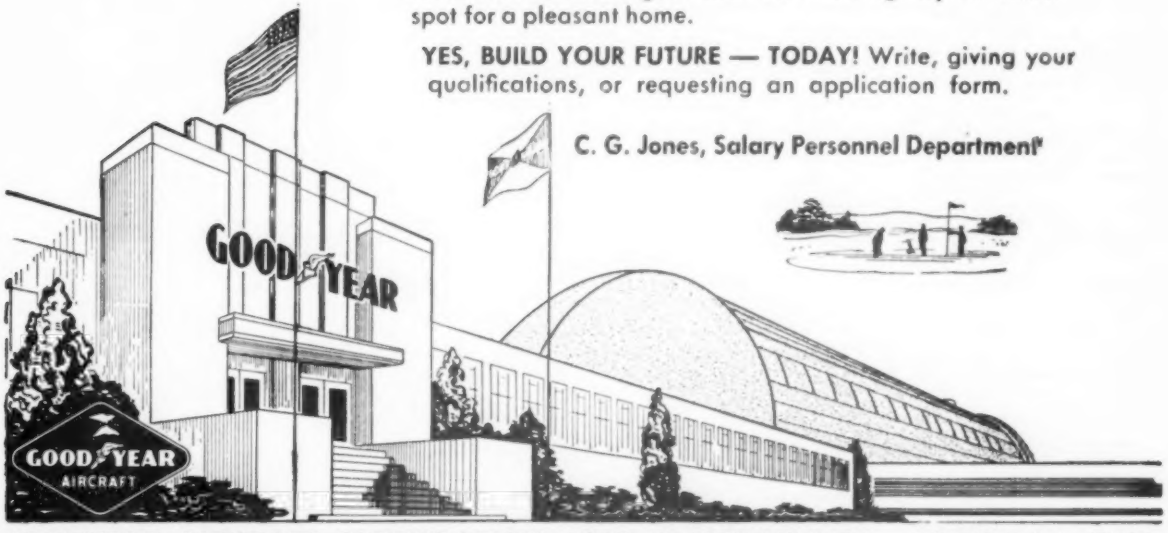
POSITIONS ARE OPEN at several levels in various fields with salaries based on education, ability and experience.

Physicists	Civil engineers
Mechanical engineers	Electrical engineers
Aeronautical engineers	Technical editors
Welding engineers	Technical illustrators

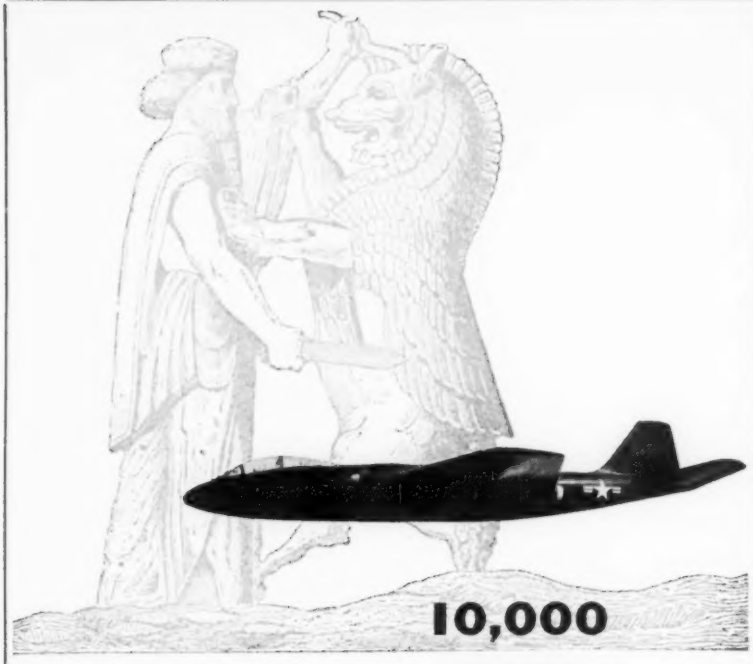
AKRON, THE HOME OF GOODYEAR AIRCRAFT, is located in the lake region of northeastern Ohio. Cosmopolitan living, year-round sports and recreation, cultural and educational advantages make this thriving city an ideal spot for a pleasant home.

YES, BUILD YOUR FUTURE — TODAY! Write, giving your qualifications, or requesting an application form.

C. G. Jones, Salary Personnel Department



GOODYEAR AIRCRAFT CORPORATION, 1210 MASSILLON RD., AKRON 15, OHIO



10,000 years of weapons engineering experience

If you're looking for an opportunity to work with the finest mindpower and facilities in the whole new world of aircraft development... if you want to harness the power of great knowledge to your own technical training... then you should know this:

Martin's engineering staff represents an aggregate of 10,000 man-years of engineering experience, covering every branch of the aeronautical sciences.

And there is—and always will be—a need for outstanding "new blood" in this organization.

If it's only a job you want, the woods are full of them. But if you are one of the few who are destined to go far in this industry, you'd be wise to take an engineer's-eye view of the mindpower and the facilities you'll be working with.

Write to J. M. Hollyday, Box A-7, The Glenn L. Martin Company

MARTIN

BALTIMORE · MARYLAND

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)
LOS ANGELES: 1111 Wilshire Blvd. (17)

POSITIONS VACANT

(Additional Position Vacant Ads on pages 103, 105, 109)

QUALITY CONTROL Manager with recent experience on fighter aircraft, capable of taking complete charge of quality control section of a manufacturer doing subcontract work on airframes and components. Outline complete experience and state salary expected. P-4080, Aviation Week.

DESIGN ENGINEER, M.E. To design, develop and test jet engine components such as nozzle fingers, tailpipe liners, spray bars and flameholders. In terms of challenge, reward, and professional growth, this opportunity with one of the country's outstanding industrial organizations is well worth investigating. If you seek continuing, long-range opportunity, you are invited to apply now, submitting complete resume, together with salary requirements. Write to: Box 476, Room 1201, 230 W. 41 St., New York 36, N. Y.

RESEARCH ENGINEERS—Openings available for Mechanical or Aeronautical Engineers with experience in developments and test of turbo-jet engines. Room and board furnished without charge at laboratory located in northern New Hampshire. Submit resume to: Resident Engineer, Smith, Hinchman & Grylls, Inc., P. O. Box 535, Gorham, New Hampshire.

SELLING OPPORTUNITIES OFFERED

SALES ENGINEER — Adhesives. Nationally known manufacturer seeks experienced salesman for expanded West Coast activities. Must have sales experience to aircraft industry or equivalent. Permanent. Exceptional opportunity. Please give complete details in first letter. SW-3914, Aviation Week.

SALES ENGINEER, Aircraft Switches. West Coast manufacturer of aircraft electric switches seeks responsible manufacturer's representative for all territories other than Western States. Furnish complete details, references, other lines carried, etc. RW-4170, Aviation Week.

POSITIONS WANTED

EXECUTIVE PILOT position desired airline transport rating five years executive flying engineering background mechanics license DC3 Convair 240-340 C46 6000 hrs. Mel. 1500 Sel complete resume on request. PW-3895, Aviation Week.

CONTRACTS EXPERT desires to make change. B.S. & M.B.A. 14 years experience in aviation, 10 years same company. Have handled all phases of contract negotiation & administration including original cost estimating, writing proposals and brochures, negotiating contract terms & prices, contract follow and financial control, etc. Only Eastern location will be considered. Resume on request. PW-4053, Aviation Week.

NAVY PILOT, 2800 hrs., desires posit. with future. 7 yrs. exp. comm. single, multi-eng instrument ratings. Age 26. 2 yrs college. Married. PK-4068, Aviation Week.

CURRENT AIRLINE Captain—available Nov. 1st. ATR, 6500 Hrs., A&E license, Executive experience. Married, sober, reliable, references. Age 33. PW-4089, Aviation Week, San Francisco, Calif.

AVAILABLE AT once—Pilot & CoPilot combination. Former major airline captain and commercial pilot desire opportunity to establish and operate executive aircraft operation for responsible corporation. Unique industrial background of both parties guarantees satisfaction. Will provide aircraft if necessary. PW-4155, Aviation Week.

FOR SALE

Largest stock in the U.S., of new, used and overhauled engines, propellers, accessories and airframe parts. Free lists by makes. Vestco., Dept. F, Box 5306 T.A., Denver, Colo.

For Sale: Lockheed Lodestar, Model 1808. Airline interior, aircraft in process of being relicensed at San Antonio, Texas. Will consider lease. Write: Jae Company P. O. Box 6611 San Antonio 9, Texas. Phone: TAylor 6-5391.

For Sale, 6 allison engines, model EV-1710-117. Total time between 200 and 400 hours since new. Need minor overhaul. Less auxiliary stage supercharger. Engines boxed and ready for shipment. Bids will be received until 12:00 noon of November 1, 1954. Full information available from Dean, School of Engineering, University of Wichita, Witchita, Kansas.

Navion, Ryley twin 150 HP engines 110 hrs since new. Airframe 400 hrs since new 80 gal. fuel, Lear and RCA VHF transmitters, Lear Ommin scope, RCA Beacon receiver, full panel flight instruments. Corporation aircraft always hangared and excellently maintained. $30,000. Burrus Mills, Inc. Box 13225 Dallas 20, Texas.

LYCOMING

IS LOOKING FOR ENGINEERS!

● Here is an opportunity to work with internationally famous engineers, in the design and development of aircraft engines (gas turbine, reciprocating or related fields).

If you can qualify in the following, we will arrange a personal interview, with our Engineers, to discuss the many opportunities available at Lycoming.

- PROJECT ENGINEERS
- LAYOUT DESIGNERS & DRAFTSMEN
- DESIGN DRAFTSMEN
- DESIGN ENGINEERS
- ANALYSTS
- CHECKERS

Send complete resume to:

E. E. Blakeslee, *Per. Supv.*

AVCO MANUFACTURING CORPORATION

Lycoming Division
Avco Mfg. Corp.
Stratford, Conn.

Carl Vrooman, icing tunnel group head, studies hot-air cyclic de-icing test on wing section of C-130 transport. The tunnel has a temperature range of −40° F. to +150° F. and maximum air speed of more than 270 mph.

New icing tunnel speeds thermodynamics research at Lockheed

Designed to meet a constantly increasing volume of thermodynamics work, Lockheed's new icing research tunnel now provides year 'round testing in meteorological environments normally found only in flight. It is the first icing research tunnel in private industry.

Lockheed thermodynamics scientists are now able to study in greater detail problems such as: thermal anti-icing; cyclic de-icing; various methods of ice removal; distribution of ice; rate of temperature changes in aircraft components; thermodynamic correlation between laboratory and flight testing; and development and calibration of special instrumentation.

C. H. Fish, design engineer assigned to the tunnel, measures impingement limits of ice on C-130 wing section. The tunnel has refrigeration capacity of 100 tons, provides icing conditions of 0 to 4 grams per cubic meter, droplet sizes from 5 to 1000 microns.

Thermodynamics Career Opportunities

Increasing development work on nuclear energy, turbo-prop and jet transports, radar search planes and supersonic aircraft has created a number of positions for Thermodynamics Engineers and Thermodynamicists.

Lockheed offers you increased salary rates now in effect; generous travel and moving allowances; an opportunity to enjoy Southern California life; and an extremely wide range of employee benefits which add approximately 14% to each engineer's salary in the form of insurance, retirement pension, sick leave with pay, etc.

You are invited to write E. W. Des Lauriers for a brochure describing life and work at Lockheed and an application blank.

B. L. Messinger, department head, analyzes test results with Thermodynamics Engineer E. F. Versaw (right) and Thermodynamicist Tom Sedgwick (left).

LOCKHEED
AIRCRAFT CORPORATION
BURBANK
CALIFORNIA

Engineers!!

There's A

"*New Look*"

at

CESSNA AIRCRAFT COMPANY

New Salary Structure

New Assignments

New Models

FOR CONFIDENTIAL EVALUATION
Send Resume To:
Employment Manager, Dept. AW
Cessna Aircraft Company, Wichita, Kansas

Cessna

CESSNA AIRCRAFT COMPANY • WICHITA, KANSAS

ATTENTION ENGINEERS

Aeronca Manufacturing Corporation

a leading sub-contractor for the aircraft industry has immediate openings in its new research and development group for engineers qualified in

Applied Aerodynamics
Flight Control Systems
Aircraft Structures
Propulsion Systems
Electronics

Build your career with an expanding progressive company where advancement is assured for engineers with ability and initiative.

If you have three or more years' experience, a basic or advanced engineering degree, and are capable of original development activity in aircraft and missile systems, you are invited to contact our

Personnel Office
at 1712 Germantown Road,
Middletown, Ohio

ELECTRICAL—ELECTRONICS
DESIGN ENGINEERS
Long Range Program—Aircraft Trainers
Challenging, creative assignments in an expanding and progressive organization. BSEE plus experience in electro-mechanical devices, servo-mechanisms or analogue computers desirable. Send complete resume to:
STANLEY AVIATION CORPORATION
Buffalo Municipal Airport Buffalo 25, New York

AERODYNAMICIST

Leading jet engine manufacturer, located in midwest, offers challenging opportunity to perform aerodynamic design functions to obtain ejector nozzle flows for maximum performance, burner for minimum dry losses, and maximum augmented range capabilities.

This opening is with a rapidly-expanding division of our multi-plant company, where individual growth opportunity and potential are excellent.

Please submit full details in first letter, and include salary requirements.

Write Box 477, Room 1201
230 West 41 Street
New York 36, N. Y.

PILOTS and FLIGHT ENGINEERS wanted by UNITED AIR LINES

Career opportunities with the nation's number one airline now open to qualified men. Many company benefits including excellent pay, broad insurance program, retirement income plan and others.

Qualifications: Height 5'-7" to 6'4". U.S. citizen, high school graduate, commercial pilot license, pass flight physical with no waivers. Age 21-26.

Applicants who, in addition to above qualifications also have Instrument Rating or Flight Engineer's Certificate (or Flight Engineer's examination written portion passed) will be accepted through age 27; with both Instrument Rating and Flight Engineer's Certificate through age 28.

Successful applicants will attend United's Flight Training Center at Denver, Colorado and receive salary while training.

Write: C. M. Urbach
Placement Superintendent Dept 22
United Air Lines Operating Base
Stapleton Airfield,
Denver, Colorado

VIRGINIA COMPANY
developing
MISSILE PROPULSION SYSTEMS
needs

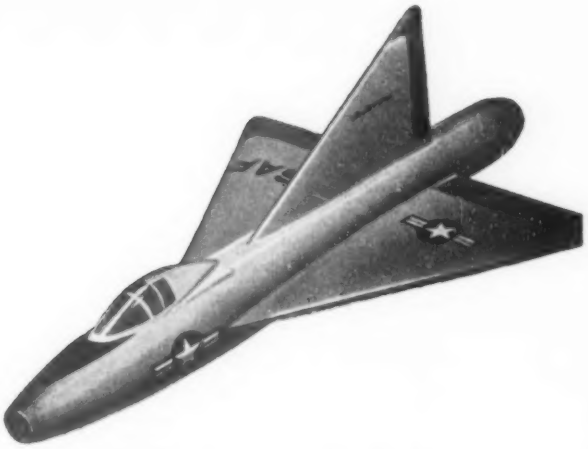
MECHANICAL DESIGNERS
STRESS ANALYSTS
VIBRATION ANALYSTS
DESIGN DRAFTSMEN

A background in gas turbines is particularly desirable

AN OPPORTUNITY

for personal growth with a rapidly expanding company under attractive working conditions and unusually liberal employee benefits. All inquiries will be treated confidentially.

EXPERIMENT INCORPORATED
Richmond 2, Virginia



THE CONVAIR CHALLENGE TO ENGINEERS OF EXCEPTIONAL ABILITY

Beyond the obvious fact that Convair in San Diego offers you a way of living judged by most as the nation's finest from the standpoint of weather, beauty and interesting surroundings, the Convair Engineering Department offers you challenges found in few places.

It is, we believe, an "engineers" engineering department—interesting, energetic, explorative — with the diversity that means security for capable personnel.

As proof, consider this: Convair developed and flew the world's first turbo-prop airplane, first delta-wing airplane, first delta-wing seaplane — engineered and built the world's biggest transport, the world's safest high-performance commercial aircraft.

Or this: Convair's B-36 is the world's largest operational bomber, Convair's B-24 Liberator was World War II's most used heavy bomber, Convair's XP5Y-1 holds the world's endurance record for turbo-prop aircraft.

Or this: Convair has been awarded the nation's first production missile contract and the first production contract for supersonic interceptors.

Currently . . . Convair has the greatest diversity of aircraft engineering projects in the country, including high-performance fighters, heavy bombers, large flying boats, transports, trainers, seaplane fighters and guided missiles.

Currently . . . Convair has a completely integrated electronic development section engaged in advanced development and design on missile guidance, avionic projects and radar systems.

Would you like to join us? We earnestly need engineers of proven ability — men who want to make full use of their time, their minds, their skills and abilities solving the complex problems confronting us in these projects. If you are such a man, write us and we'll send you a free booklet about us, plus other interesting material to help you make the decision.

Write: H. T. BROOKS, Engineering Personnel
Department 200

CONVAIR

3302 PACIFIC HIWAY

in beautiful San Diego, California

ENGINEERS

■ ADMINISTRATIVE ■ SENIOR ■ PROJECT

■ INTERMEDIATE ■ JUNIOR

LONG RANGE PROGRAMS IN . . .

RESEARCH

DEVELOPMENT

DESIGN

- Fire Control Systems
- Radar Systems
- Communications
- Navigation
- Transistors
- Guided Missiles
- Telemetering

DIRECT INQUIRIES TO—

Director of Engineering
Government Products
CROSLEY DIVISION
AVCO Manufacturing Corporation
Cincinnati 15, Ohio

---

manufacturer's representative
WANTED

• to represent large mid-western subcontractor. To obtain aircraft quality or commercial contracts for general machining, tube bending, stamping, forming and welded assemblies. Commission and expenses. No objections to non-conflicting lines. Forward complete resume and territory covered to

HOLLAND AGENCY
2530 Auburn Ave., Cincinnati 19, O.

SALES ENGINEERING REPRESENTATIVES

Established Mid-West manufacturer of hydraulic, pneumatic, mechanical, and electro-mechanical controls has opening for qualified men in Philadelphia, Baltimore, and Washington. Also New York and New England territories.

Graduate Engineers with Aircraft Engineering and Sales experience desired.

Please submit resume, together with photo (if available) and salary requirements. All replies held in confidence.

RW-4159, Aviation Week
520 N. Michigan Ave., Chicago 11, Ill.

LIQUIDATING ENTIRE STOCK!!

must sell immediately

$750,000

LODESTAR

and

WRIGHT INVENTORY

2—1830-92 Pratt & Whitney Engines
will be sold at sacrifice

Inspection by appointment *Bulk sales only*

HELICOPTER UTILITIES, INC.

IV9-1037 **67 High Street, Hempstead, N. Y.**

FOR SALE

LATE MODEL D-18S

Manufactured in 1953
400 hours Total Time
Numerous extras - - -
L-2 Autopilot With Auto App.
Sperry Zero Reader
Deluxe Radio Installation

Call - Write - Wire

PAGE AIRWAYS, INC.
Rochester Airport - Rochester, New York
Genesee 7301

SUPER-92

over **200** mph for your **DC-3**

CAA Approved R1830-SUPER-92 engines allow 700 HP normal cruise, better single engine—lower fuel and maintenance mileage costs with 20,000 extra miles between changes, with same overhaul intervals and costs as —92. Fully interchangeable with —92 —same weight, mounts, cowls, lines, etc. Proven by thousands of hours of practical executive operation.

ENGINE WORKS

LAMBERT FIELD INC. ST. LOUIS, MO.
PRATT & WHITNEY CONTINENTAL
WRIGHT LYCOMING
SALE OVERHAUL EXCHANGE

NEW LOW PRICES

R-1340-AN-1 Pratt & Whitney **ENGINES** (Standard Cylinders).

R-1340-AN-1 40-spline Pratt & Whitney **CRANKSHAFTS.**

12D40 Hamilton Standard **PROPELLERS** AND **HUBS.**

All certified ZERO TIME SOH by CAA approved shops.

North American AT-6, SNJ **AIRCRAFT** and components. One SNJ-4 zero-time SOH.

JOHN B. ROSENTHAL INC.
1025 Merner Road, San Mateo, Calif.
Telephone Diamond 4-0503
Cable address JUNRO SAN MATEO.

RATES—INFORMATION

Special Services to the Aviation Industry

Rates are per insertion:

Ad	26 insertions	52 insertions
1 inch	$16.70	$16.30
2 inch	32.60	31.40
3 inch	48.90	47.10
4 inch	62.80	59.80

Advertisements will be grouped under headings suitable to content of advertising. Write for folder: Aviation Week — Classified Adv. Division, 330 West 42nd Street, New York 36, N. Y.

SPECIAL SERVICES TO THE AVIATION INDUSTRY

AIRCRAFT DEALERS

EXECUTIVE AIRCRAFT
Complete Services and Sales
DC-3 LODESTAR D18S

Inc. of ST. LOUIS **REMMERT-WERNER** Inc. of TOLEDO

PARTS & SUPPLIES

R. K. Brown Co.
PARTS SPECIALIST

STROMBERG INJECTION CARBURETOR
CARBURETORS PARTS ASSEMBLIES
CARBURETORS SUPPLIED IN REPAIRABLE CONDITION OR OVERHAULED AND CERTIFIED BY CAA APPROVED REPAIR STATION.
Parts also available for Holley Carburetors
238-A PARK AVE. EAST RUTHERFORD, N. J.
WEbster 9-9250, 9-9251 Cable Address "Brownaero"

NAVCO INC. Lambert Field St. Louis, Mo. TErryhill 5-1511
Has all Parts and Supplies for Executive DC-3 LODESTAR BEECH
Airframe: A.R.C. Bendix P&W Continental
Engines: Collins Lear Wright
Radios: Sperry Wilcox Goodrich Goodyear

INSTRUMENT SERVICE

RAS AIRCRAFT
ELECTRONIC SPECIALISTS
CUSTOM INSTALLATIONS OF
ARC . . BENDIX . . COLLINS
NARCO . . ECLIPSE . . SPERRY
LEAR
READING AVIATION SERVICE, INC.
MUNICIPAL AIRPORT READING, PA.

DIAL REFINISHING
We can refinish your dials or can supply many standard dials from our stock.
Screen Process or Hand Painted.
Fluorescent - Phosphorescent - Radium.
Special Dials made to order. Prompt Delivery.
Reasonable prices.
SOONER DIAL CO.
Box 234 - Clinton, Oklahoma - Phone 486

Reach those potential users of your special services, at reasonable cost, through this SPECIAL SERVICES SECTION.

control engineers

A further expansion of Honeywell's Aeronautical Division has created the following unusual opportunities. If you are interested in a permanent position with America's largest control manufacturer, consider these challenging opportunities now available at top salaries.

MECHANICAL DESIGN ENGINEER —GYROS

New positions open in the design of mechanical components of gyros, accelerometers, synchros and other related devices. Requires minimum of 5 years experience in mechanical design.

HYDRAULICS DESIGN ENGINEER

New opportunity in design of hydraulic components and systems involving servos, valves, actuators for automatic flight controls. Requires engineering degree or equivalent and 5 years' design experience.

RESEARCH ENGINEER —GYROS

Unusual new position open in Research Department for engineer to work on extremely low friction, low error and high precision multi axis gyro platforms. Position requires a Mechanical Engineer or Physicist with experience or advanced training in machine design, gyro principles and analytical mathematics.

METHODS ENGINEER —GYROS

New position open as methods engineer working primarily on the assembly of precision gyros and other small devices. College degree or equivalent desirable plus 5 years' experience in similar or related work.

AERODYNAMICIST AND HELICOPTER DYNAMICIST

Two new challenging positions open for an aerodynamicist and a helicopter dynamacist in the research phase of autopilot development. Will involve work on control dynamics of the airplane or helicopter, analytical investigations of control problems and correlation of experimental results with analytical predictions. Advanced degree in engineering, physics or mathematics or equivalent experience desired.

SERVOMECHANISM RESEARCH ENGINEER

Newly created position open in our Analytical Section studying control operations as simulated on our "Reac" computer. Work will be primarily in field of jet engine controls and will require an understanding of jet engine operation and control problems. Analog computer experience is necessary.

If you are interested in any of these well paid positions located in Honeywell's new Aeronautical Plant in Minneapolis, send your resumes to—

MINNEAPOLIS **Honeywell** *First in Controls*

J. Arthur Johnson
Director of Engineering Placement
Dept. AW-10
Minneapolis-Honeywell Regulator Co.
Minneapolis 8, Minnesota

SPECIAL SERVICES TO THE AVIATION INDUSTRY

OVERHAUL & MAINTENANCE

REMMERT — WERNER, Inc.
Lambert Field St. Louis, Mo.
offers your choice of
1 DAY 100 hour INSPECTIONS or 2 DAY 100 hour OVERHAULS for 3 DAY
BEECHCRAFT DC-3 LODESTAR

RENDER A SERVICE?
Write for rates.

WANTED

WANTED—Surplus Aircraft Parts
or termination inventories.
Get our cash offer by return mail.
Send lists to:
COLLINS ENGINEERING COMPANY
9050 Washington Blvd. Culver City, Calif.

WANTED—SURPLUS ROD & BAR
Stainless—Aluminum—Steel—Brass
Any size type and quantity. Cash for termination inventories. Send list to:
COLLINS ENGINEERING COMPANY
9050 Washington Blvd. Culver City, Calif.

ALL AVIATION INSTRUMENTS

EMERGENCY REPLACEMENT • OVERHAUL • SALE

Instrument Associates offers you the services of their CAA approved laboratories for fast overhaul, modification and sales of aviation instruments. Whether one instrument or thousands, our production line facilities for the overhaul of instruments results in a savings of both time and money. If your instrument needs are electronic, gyroscopic or pressure, Instrument Associates can serve you.

Authorized Sales and Service for

ECLIPSE — PIONEER • KOLLSMAN • U. S. GAUGE
L. N. SCHWIEN ENG CO. • EXIDE AIRCRAFT BATTERIES

CONTRACTORS TO U. S. A. F.—U. S. N.—DOMINION OF CANADA

C.A.A. APPROVED REPAIR STATION #3564
INSTRUMENTS CLASS 1, 2, 3, 4
AND LIMITED ACCESSORIES

INSTRUMENT ASSOCIATES

351 GREAT NECK ROAD, GREAT NECK, N. Y.
Telephone HUnter 2-9300

Write for Catalog NE100 U. S. Export License-2140 Western Union address: WUX Great Neck, N.Y.

HILLER HELICOPTER

Model UH 12A with Agricultural Spray equipment, full canopy, dual controls, 2-way radio.

In excellent condition

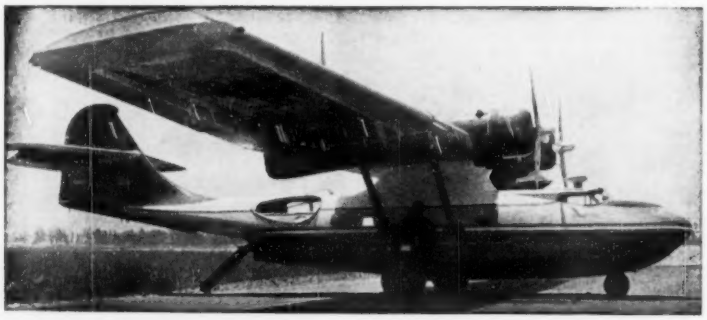
East Coast Aviation Corporation
Bedford Airport Lexington, Mass.

FOR SALE

1—P39, 1—P40N, 5—F51, 5—T6, 1—DC3, 1—C47, 1—B25, 5—BT13, 3—T35, 1—P38, & Parts for Above, Plus P&W, Ham Std Parts.

HARDWICK AIRCRAFT
Rosemead, (L.A. County), Calif.

PBY5A Specialists



Complete Overhaul & Maintenance of All Types of Aircraft

WE HAVE SEVERAL PBY5A AIRCRAFT FOR SALE
DISTRIBUTORS FOR BENDIX & LEAR RADIO
DEALER FOR COLLINS RADIO

Southern California Aircraft Corp.

Box 433 *Ph: Ontario 6-3871* Ontario, Calif.

Where to Buy

PRODUCTS - SERVICES
ACCESSORIES

NEED BETTER CASTINGS?

...specify... NON-GRAN

***Spun* CENTRIFUGAL CASTINGS**

. . . for liners, rings, rolls, sleeves, bushings, etc. Write for booklet.

AMERICAN NON-GRAN BRONZE CO.
Berwyn, Penna.
Precision Machine Work
Castings — Sand and Centrifugal

BOWERS BATTERIES

Always Better

BOWERS BATTERY & SPARK PLUG CO., READING, PA.

LEGAL NOTICE

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233)
SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION

Of Aviation Week published weekly at Albany, New York for October 1, 1954.

1. The name and address of the publisher, editor, and business manager is: Publisher McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York 36, N. Y.; Editor Robert H. Wood, 330 West 42nd Street, New York 36, N. Y.; Business manager, John G. Johnson, 330 West 42nd Street, New York 36, N. Y.

2. The owner is: McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York 36, N. Y.; Stockholders holding 1% or more of stock: Donald C. McGraw and Willard T. Chevalier, Trustees for Harold W. McGraw, Donald C. McGraw and Elizabeth M. Stoltzfus, all of 330 West 42nd Street, New York 36, N. Y.; Donald C. McGraw and Harold W. McGraw, Trustees for Catherine M. Rock, 330 West 42nd Street, New York 36, N. Y.; Donald C. McGraw, Executor of the Estate of Curtis W. McGraw, 330 West 42nd Street, New York 36, N. Y.; Donald C. McGraw, 330 West 42nd Street, New York 36, N. Y.; Mildred W. McGraw, Madison, New Jersey; Grace W. Mehren, 536 Arenas Street, LaJolla, California; Touchstone & Company, c/o Wellington Fund, Inc., Claymont, Del.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: 47,237.

McGRAW-HILL PUBLISHING COMPANY, INC.
By J. A. GERARDI, Vice Pres. & Treas.

Sworn to and subscribed before me this 14th day of September, 1954.

[SEAL] ELVA G. MASLIN
(My Commission expires March 30, 1956)

ELASTIC NUTS! BOOT NUTS! AN NUTS! TINNERMAN NUTS!

Immediate delivery from the world's largest stock of aircraft parts!

IMPORTANT! Check this ad carefully each time it appears—new offerings, never before advertised, will be listed! This group is just a small sample of our huge stock. Let us screen your inquiries for aircraft parts, accessories, AN and NAS hardware!

ELASTIC NUTS

PIECES	
9,000	22-A1K-82
940	22-HA2-S82
2,146	22-A1-048 (BC100x200)
1,390	22-LA1-048
1,220	22-HA1-82
1,705	22-A2-048 (BC100x200)
660	22A3-82
1,560	22A3-048
16,400	22C3-82
1,240	22A5-62 (BC100x200)
5,744	22A6-82 (BC100x200)
7,500	22A6-82
30,368	22HA6-82 (BC82x180)
3,000	22A6-82
24,000	22D8-82
2,150	22A9-82
1,800	22A12-68
3,655	22D12-82
16,498	22A12-048
29,000	22A14-82
1,169	22A16-82
4,900	22A17-86
1,620	22A18-048
480	22NK21-2-82
3,685	22A21-2-86
3,110	22A21-22-048
4,810	22A21-68-82
4,000	22A25-82
2,500	22A25-048
2,160	22A25-82
6,247	22A25-054
1,458	22A35-064
3,217	22A37-2-86
3,950	22A37-6-82
3,000	22TU-092
1,500	42D20-054
438	50FH820
518	52A1-098
4,710	68A1-62 (BC100x200)
5,000	68A1-82 (BC100x200)
38,500	68A2-04 (BC100)
1,510	68A2-82 (BC100)
1,455	68A2-048 (BC100x200)
6,000	68C3-48
7,495	68A5-82
8,535	68A5-84
1,950	68A5-82
2,500	68A5-048
1,956	68A5-054
3,164	68A6-82
61,504	68A12-04
1,300	68A12-62
8,159	68A12-82
81,000	68A12-048
3,450	68A12-068
2,893	68A14-04
5,130	68A14-62
2,400	68A14-048
1,496	68A16-04
3,269	68A17-82 (BC100)
7,625	68A17-04
1,000	68A17-62 (BC100x200)
6,000	68A17-82
1,000	68A17-048
2,450	68A17-068 (BC100x200)
1,500	68A19-048
1,520	68A21-6-04
1,880	61A21-6-048
2,480	68A24-04
2,473	68A24-62 (BC100x200)
2,476	68A24-048
1,854	68A27-6-82
2,780	68A35-82
2,087	68A35-048
2,000	68A37-6-04
24,000	68A38-82 (BC100x200)
6,716	68U-101

BOOT NUTS

PIECES	
31,500	W1D-832
31,000	W1S-1032 (BC100x200)
4,248	W1S-1032 HR
4,000	W1D-1032
7,150	W2D-832
47,100	W2DH-832
1,000	W2SE-832
8,140	W2SH-832 (BC100x200)
10,900	W2DE-1024 (BC100x188)
53,970	W2SH-1032 (BC100)
261,143	W2SE-1032 (BC100)
14,268	FSD-832D
5,441	FSS-836D
96,322	FSS-836S
221,000	FSD-1024D
153,000	ALSSF-1032
52,000	FSS-1032D
1,618	FSS-1032S
13,166	W5S-1032D
5,000	F5S-1032S
4,200	W6D-632
12,600	F5S-832DR
7,440	W7D4-28
97,399	W7S-428
26,350	W7D-632
34,000	W7S-632
1,220	W7S-1032
13,790	W12S-1032
131,944	W12S-1032-(BC100)

AN NUTS

PIECES	
11,900	AN310-D3
2,500	-D4
432	-D5
600	-5
9,000	-10
2,193	-D10
4,800	-12
655	-D14
2,224	-D16
60	-1018
378	AN315-5R
5,180	-D5R
3,148	-D10R
3,700	-D648R
1,100	AN316-C4R
3,342	-72
4,250	-102
358	BA16
8,320	AN320-D5
2,974	-C7
13,450	-D8
940	-D10
412	-20
2,200	AN330-4
3,880	-9
588	AN335-10
600	AN340-B3
530	AN340-3R
300	-DD4
4,172	AN345-DD6
3,440	-D8
1,498	AN350-B640
2,000	-836
980	-D1024
67,500	AN364-640
1,900	-D720
500	-B832
3,500	-B836
2,935	-D918
2,739	-D1018
3,729	-1024
2,000	-D1024
2,775	-D1024
1,100	-B1032
15,000	-D1032
500	-1414
41,000	AN365-B428
17,000	-D428
2,068,000	-448
2,000	-B524
49,000	-D524
75,000	-D624
167,000	-632
35,000	-B632
2,167,354	-640
68,000	-D640
6,585	-D720
164,000	-B832
122,000	-D832
2,688,000	-836
40,000	-1024
24,000	-B1032
591	-1616
550	-1616
975	-B1008
2,130	AN366-D420
16,543	-428
13,000	-DF428
3,000	-D428
2,258	-D524
945	-DF624
800	-DF640
75,500	-F640
7,000	-832
103,660	-DF832
2,690	-DF836
66,000	-F836
57,490	-DF1024
43,000	-1032
56,000	-DF1032
324,000	-F1032
85,000	AN367-DF420
12,000	-F420
21,000	-DF428
2,000	-DF524
2,647	-F524
65,000	-DF632
2,400	-F632
12,950	-F640
153,500	-DF832
6,400	-F832
58,247	-DF836
9,838	-DF1024
6,980	-1032
20,000	-DF1032
183,000	AN372-632
7,000	-836
8,000	-1032

TINNERMAN NUTS

PIECES	
1,000	A1110-6Z-1
55,000	A1181-6Z-1
100	A1274-8Z-3
14,800	A1776-4Z-1
2,811	A1778-6Z-1
78,750	A1778-8Z-1
700	A1778-8Z-3
1,360	A1779-8Z-1
11,677	A1779-10Z-1
3,645	A1779-10Z-3
6,500	A1781-6Z-1
2,000	A1781-10Z-1
323,285	A1784-6Z-1
2,800	A1784-6Z-6
19,000	A1786-8J-1
1,890	A1786-8Z-1
2,500	A1787-8Z-1
2,800	A1788-6Z-1
3,001	A1788-8Z-1
103,945	A1789-8Z-1
64,949	A1791-10Z-1
3,800	A1791-100-1
52,900	A1794-10Z-1
300	A1794-10Z-3
410	A1795-10Z-1
1,550	A1797-10Z-1
10,050	A1801-6Z-1
810	A1801-8Z-1
3,500	A1804-6L-1
21,860	A1807-10Z-1
7,490	A1808-10Z-1
11,160	A1817-10Z-3
821	A1819-10Z-1
29,416	A1912-8Z-1
680	A1912-8Z-3
1,351	A6065-6Z-1
1,960	A6069-8Z-1
455	A6083-8Z-1
292	A6091-10Z-1
220	A6091-10Z-3
3,212	A6162-6Z-1
24,500	A6162-8Z-1
35,460	A6162-10Z-1
1,800	A6161-8Z-1
1,410	A6161-10Z-1
2,859	A6187-4Z-1
2,300	A6187-4Z-3
360	A6191-4Z-1
14,550	A6191-6Z
10,880	A6191-6Z-1
4,320	A6191-8Z
363,000	A6191-8Z-1
1,000	A6191-10Z
17,000	A6191-10Z-1
1,150	A6191-10Z-3
74,490	A6192-8Z
9,900	A6193-SS-10S
4,820	A6193-SS-10Z
429	6193-102-SS
2,163	A6194-6Z-1
350	A6194-6Z-3
1,222	A6194-8Z-1
10,000	A6195-8Z-1
10,250	A6195-6Z-1
34,000	A6195-8Z-1
226	A6195-8Z-3
900	A6195-812-1
2,893	A6196-6Z-1
3,569	A6196-8Z-1
2,000	A6196-10Z-1
14,000	A6195-10Z-1
1,300	A6200-4Z-1
158	A6200-6Z-1
1,644	A6200-8Z-1
21,170	A6200-10Z-1
1,589	A6201-6Z-1
2,850	A6201-8Z-1
2,663	A6201-10Z-1
2,884	A6203-8Z-1
4,410	A6203-10Z-1
1,160	A6204-8Z-1
1,539	A6204-10Z-1
200	A6220-8Z-4D
188	A6220-8Z-5P
1,009	A6220-8Z-6D
757	A6220-8Z-7P
232	A6220-8Z-9P
236	A6220-8Z-10P
192	A6220-8Z-32D
192	A6220-8Z-37D
785	A6220-8Z-38D
788	A6220-4Z-4D
960	A6242-10Z-812-3
5,119	A6242-10Z-851-1
108	A6251-10Z-2P
2,604	A6264-10Z-1
717	A6270-6Z-1
690	A6279-10Z-1
651	A6308-10Z-1
2,200	A6320-2-10Z
7,420	A6327-6Z-1
720	A6328-8Z-1
800	A6329-10Z-1
3,300	A6344-6Z-C1
300	A6352-8Z-1
220	A6352-10Z-1
280	A6410-8Z-1
3,200	A6416-6Z-1
2,460	A6416-8Z-1
2,450	A6417-10Z-1
4,930	A6419-8Z-1
3,160	A6420-2-10Z
235	A6421-10Z-6P
2,545	A6412-8Z-025-1
1,192	A6432-10Z-051-1
250	A6436-10Z-3
4,450	A6437-10Z-1
3,545	A6452-8Z-072-1
400	A6483-8Z-3
2,105	A6500-6Z-1
6,150	A6509-10Z-1
3,240	A6521-6Z-24
854	A6521-SS-8Z-3D
541	A6521-8Z-4D
795	A6521-SS-8Z-4D
1,858	A6521-SS-8Z-6D
536	A6521-8Z-7D
436	A6521-8Z-13D
422	A6521-8Z-17D
1,106	A6521-10Z-2D
1,300	A6521-10Z-4D

GANG CHANNEL NUTS BOOTS

STRIPS	
46	W3S-428-7
127	W3D-428-10
97	W3S-428-10
17	W3S-428-14
76	W3D-428-16
25	W3S-428-18
10	W3S-832-10
11	W3S-832-12
712	W1D-832-16
3,334	W1D-832-20
4,981	W1S-836-10
145	W3S-836-16
377	W3S-836-20
997	W3D-1032-5
404	W3D-1032-6
25	W3D-1032-7
161	W3S-1032-8
1,856	W3S-1032-14
26	W3S-1032-16
451	W3D-1032-20
18	W4SH-428-7
13	W4SH-832-5
43	W4SH-836-12
42	W4S-1032-6
46	W4SH-1032-7
24	W4SN-1032-8
70	W4DH-1032-10
604	W4DE-1032-14
79	W4H-1032-16
10	W4S-1032-20
36	W5ISH-428-10
150	W5IS-428-18
31	W5IS-1032-16
25	W5IS-1032-20
17	W5IEE-428-7
25	W5ESH-832-20
10	W5ESH-1032-7

GANG CHANNEL NUTS ELASTIC

STRIPS	
4,444	22RG1-02-7-19-9
5,000	22RG1-02-10-19-6
72	22RG1-02-10-24.7
18	22RG1-02-1234-9
6,010	22RG1-02-14-39-9
107	22G1-02-24
32	22G1-82-5
245	22NG1-82-J5
472	22NG1-82-J7
37	22G1-82-8
130	22NG1-048-J14
39	22G1-048-14
2,011	22RG1-048-8-30-12
2,067	22NG1-048-J16
1,191	22NG1-054-J16
100	22G1-06-5
130	22RG1-06-6-59-31
100	22G1048-18
1,077	22G1-048-18
45	22G1-048-28
27	22G1-054-7
100	22G1-064-14
39	22G1-064-12
12	22G2-82-18
58	22RG2-02-12-24-6
595	22G2-02-14
18	22G2-82-16
44	22G2-86-5
83	22RG5-02-6-24-12
17	22G5-82-8
141	68G1-02-5
68	68G1-02-6
571	68G1-02-8
185	68G1-832-16

COMMERCIAL SURPLUS SALES CO.

4101 CURTIS AVENUE, BALTIMORE 26, MARYLAND

TELEPHONE: CURTIS 7-3300

News Sidelights

Detroit sources are confident newly formed Studebaker-Packard Corp. soon will receive a major Air Force contract, perhaps for production of a new jet engine. Both companies have had experience building the General Electric J47.

Air Navigation Development Board plans to evaluate a low-cost British Decca Radar, Ltd., developed airport surface detection equipment (taxi radar) that reportedly sells for a fraction of the cost of taxi radars under development in the U. S.

A wide restricted zone has been established around the site for AF's new Air Academy by the local county zoning board so that the area "will be one that all Colorado can be proud of." No buildings can be erected in the "buffer zone" without the board's permission. The Air Academy site (AVIATION WEEK July 12, p. 18) is about 13 mi. northwest of Colorado Springs.

An airline pilots' community on the site of a portion of the Marshall Field estate on Long Island is in the making, with the pilots pledging to buy 55 of the first 68 plots for home building. Pilots have formed the Construction Corp. of Long Island, reported to be worth $250,000, to sub-divide the acreage and build the homes.

First P-38 to have a pressurized cockpit has been completed by AiResearch Aviation Supply Corp., Los Angeles, to permit aerial surveys from altitudes up to 35,000 ft. Compressed air is bled from turbosuperchargers on the engines to give two pounds per square inch pressure differential above 10,000 ft. The two-place P-38 is owned by Mark Hurd Mapping Co., Minneapolis, Minn.

The appraisal of U. S.'s airpower program by Sen. Leverett Saltonstall, text of which appeared in full in AVIATION WEEK Sept. 27 (p. 23), was delivered on the floor of the Senate Aug. 7, although date of preparation on the official document was July 28.

Army's Honest John artillery missiles are protected with electric blankets prior to firing to keep their explosive charge at proper temperature. Blankets are made by General Electric Co., according to reports.

Airpower does it again: Anti-Communist leader Col. Carlos Castillo Armos told AVIATION WEEK during a discussion of the recent revolution in Guatemala that "without the help of our three Cessna 180s, there is serious doubt that we could have been as successful so soon in forcing the resignation of the former pro-Red government."

Carlene Roberts Weds Commerce Official

Mrs. Lothair Tector, formerly Carlene Roberts, an American Airlines vice president, leaves Metropolitan Memorial Methodist Church in Washington, D. C., with her husband, the Assistant Secretary of Commerce, after their wedding Sept. 27. Miss Roberts, left American Sept. 15.

AVIATION CALENDAR

Oct. 13-15—American Assn. of Airport Executives, 1954 conference on airport management and operations, University of Oklahoma, Norman, Okla.

Oct. 14-15—Illinois Institute of Technology and Armour Research Foundation, National Conference on Industrial Hydraulics, Sheraton Hotel, Chicago.

Oct. 14-15—Institute of the Aeronautical Sciences and Canadian Aeronautical Institute, joint meeting, Montreal.

Oct. 17-22—International Union of Aviation Insurers, annual meeting, Waldorf-Astoria Hotel, New York.

Oct. 18-19—American Society of Mechanical Engineers and American Society of Lubrication Engineers, lubrication conference, Lord Baltimore Hotel, Baltimore.

Oct. 18-22—National Safety Council, Aeronautical Section, Conrad Hilton, Chicago.

Oct. 19-20—Seventh annual New York State Airport Development and Operation Conference, Syracuse, N. Y.

Oct. 21-23—American Society for Quality Control, eighth New England conference, Ten Eyck Hotel, Albany, N. Y.

Oct. 23—Airmail Pioneers, division reunion, VFW Club, Elmhurst, Ill.

Oct. 24-27—National Defense Transportation, ninth annual convention, including panel on Military and Civilian Use of Helicopters, Pittsburgh.

Oct. 27-29—National Business Aircraft Assn., seventh annual meeting and forum, Hotel Adolphus, Dallas.

Oct. 28-29—Aircraft Electrical Society, 11th annual display meeting, Pan Pacific Auditorium, Los Angeles.

Nov. 1-5—American Welding Society, fall meeting, Sherman Hotel, Chicago.

Nov. 2-19—American University eighth Air Transportation Institute, Washington.

Nov. 4-5—Airborne and Navigational Electronics, East Coast conference, Sheraton-Belvedere Hotel, Baltimore.

Nov. 8-9—National Aviation Trades Assn., annual convention and meeting, Biltmore Terrace Hotel, Miami Beach, Fla.

Nov. 8-10—Air Industries & Transport Assn. of Canada, annual meeting, Chateau Frontenac, Quebec City.

Nov. 9-12—Air Line Pilots Assn., convention, Sheraton Hotel, Chicago.

Nov. 11-12—Airmail Pioneers, division reunion, Hollywood Roosevelt Hotel, Los Angeles.

Nov. 12-13—National Symposium on Quality Control and Reliability in Electronics, Statler Hotel, New York.

Nov. 15-17—Aviation Distributors and Manufacturers Assn., 12th annual meeting, Mayflower Hotel, Washington, D. C.

Nov. 15-17—Magnesium Assn., 10th annual meeting, Hotel Chase, St. Louis.

Nov. 18-19—American Society for Quality Control, ninth Midwest conference, Baker Hotel, Dallas.

Nov. 29-Dec. 3—American Society of Mechanical Engineers, Aviation Division, annual meeting, New York.

Nov. 30-Dec. 3—American Rocket Society, ninth annual meeting, Hotel McAlpin, New York.

ADVERTISERS IN THIS ISSUE

AVIATION WEEK—OCTOBER 11, 1954

AEROJET GENERAL CORP. 79
Agency—D'Arcy Advertising Co.
AERO INVESTMENT CASTINGS CO. 80
AIRWORK CORPORATION 70
Agency—Geare-Marston, Adv.
ALUMINUM CO. OF AMERICA 46
Agency—Fuller & Smith & Ross, Inc.
AMERICAN LATEX PRODUCTS CORP. 57, 58, 59
Agency—Anderson-McConnell, Adv. Agency
AMERICAN NON-GRAN BRONZE CO. 110
Agency—Norman P. Hewitt, Adv.
AMERICAN WELDING & MFG. CO. 31
Agency—The Bayless-Kerr Co.
ARO EQUIPMENT CORP. 88
Agency—Beeson-Reichert, Inc.

BENDIX PRODUCTS DIV. BENDIX AVIATION CORP. ..... Third Cover
Agency—MacManus, John & Adams, Inc.
BENDIX RADIO DIVISION OF BENDIX AVIATION CORP. 6
Agency—MacManus, John & Adams, Inc.
BILL JACK SCIENTIFIC INSTRUMENT CO. 60
BOWERS BATTERY & SPARK PLUG CO. 110
BREEZE CORPORATIONS, INC. 41
Agency—Burke Dowling Adams, Inc.
BRIDGEPORT THERMOSTAT DIV., ROBERTSHAW FULTON CONTROLS CO. 64
Agency—The Griswold Eshleman Co.
BRILES MFG. CO. 95
Agency—McKee-Burns Advertising

CANADAIR, LTD. 68
Agency—Walsh Advertising Co., Ltd.
CESSNA AIRCRAFT COMPANY 71
Agency—Gardner Advertising Co.
CHANDLER-EVANS DIV., NILES-BEMENT-POND CO. 91
Agency—Hugh H. Graham & Associates, Inc.
CLEVELAND PNEUMATIC TOOL CO. 65
Agency—Meldrum & Fewsmith, Inc.
COLLINS RADIO COMPANY 94
Agency—W. D. Lyon Co., Inc.
CONSOLIDATED VULTEE AIRCRAFT CORP. 19
Agency—Buchanan & Co., Inc.
COOK ELECTRIC COMPANY 82
Agency—Glenn-Jordon-Stoetzel, Inc.

DRIAIRE, INCORPORATED 8
Agency—Woodward & Byron, Inc.

EASTMAN KODAK CO. 51
Agency—J. Walter Thompson Co.
ELECTRO-AIRE, INC. 8
Agency—Ford C. McElligott & Assoc.
ESSO STANDARD OIL CO. 81
Agency—McCann-Erickson, Inc.

FAFNIR BEARING CO., THE 3
Agency—Horton-Noyes Co.
FAIRCHILD ENGINE & AIRPLANE CORP. 97
Agency—Gaynor & Co., Inc.
FOOTE BROS. GEAR & MACHINE CORP. Fourth Cover
Agency—Waldie & Briggs, Inc.
FULTON SYLPHON DIV., ROBERTSHAW-FULTON CONTROLS CO. 64
Agency—The Griswold-Eshleman Co.

GENERAL ELECTRIC COMPANY 62, 63
Agency—G. M. Basford Company
GENERAL TIRE & RUBBER CO., THE 86
Agency—D'Arcy Advertising Co.
GOODYEAR TIRE & RUBBER CO., INC. ... Front Cover
Agency—Kudner Agency, Inc.

HARTWELL AVIATION SUPPLY CO. 44
Agency—The McCarty Company
HAYDON COMPANY, THE A. W. 47
Agency—Cory Snow, Inc.
HETHERINGTON, INC. 53
Agency—The Harry P. Bridge Co.
HUGHES AIRCRAFT CO. 36
Agency—Foote, Cone & Belding

INTERNATIONAL RESISTANCE CO. 43
Agency—Arndt, Preston, Chapin, Lamb & Keen, Inc.
I-T-E CIRCUIT BREAKER CO., SPECIAL PRODUCTS DIV. 98
Agency—Heintz & Company

KEARFOTT COMPANY, INC. 61
Agency—E. M. Freystadt Associates, Inc.

LEAR, INC. 32, 33
Agency—Buchanan & Co., Inc.
LEWIS ENGINEERING COMPANY, THE 113
LOCKHEED AIRCRAFT CORP. 75
Agency—Donahue & Coe, Inc.

MARMAN PRODUCTS CO. 24
Agency—West Marquis, Inc.
MARTIN CO., THE GLENN L. 55
Agency—Vansant, Dugdale & Co., Inc.
MILLER INSTRUMENTS INC., WM. 90
Agency—Heintz & Co., Inc.

MINNEAPOLIS HONEYWELL REGULATOR CO. 92, 93
Agency—Foote, Cone & Belding
MONSANTO CHEMICAL CO. 76
Agency—Gardner Advertising Co.

NEW DEPARTURE DIV., GENERAL MOTORS CORP. 85
Agency—D. P. Brother & Co., Inc.
NORDEN LABORATORIES CORP., THE 30
Agency—G. F. Sweet & Co., Inc.
NORTH AMERICAN AVIATION, INC. 5
Agency—Batten, Barton, Durstine & Osborn, Inc.

OHIO SEAMLESS TUBE DIV. OF COPPERWELD STEEL CO. 52
Agency—Howard Swink Adv. Agency, Inc.
OMOHUNDRO CO., PAUL 20
Agency—Francis D. Gonda Co.

PESCO PRODUCTS DIV., BORG-WARNER CORP. 73
Agency—The Jayne Organization, Inc.
PIASECKI HELICOPTER CORP. 80
Agency—R. K. Davis & Bro.
PRATT WHITNEY AIRCRAFT DIV., UNITED AIRCRAFT CORP. 25
Agency—G. F. Sweet & Co., Inc.
PROTO TOOLS 4
Agency—Willard G. Gregory

RADIO CORP. OF AMERICA 26, 72
Agency—Al Paul Lefton Co., Inc.
REACTION MOTORS, INC. 67
Agency—Lenahan Advertising Agency
REMINGTON RAND, INC. 10
Agency—Leeford Adv. Agency, Inc.
REPUBLIC AVIATION CORP. 23
Agency—DeGarmo, Inc.

SCINTILLA MAGNETO DIV., BENDIX AVIATION CORP. 83
Agency—MacManus, John & Adams, Inc.
SNAP-ON TOOLS CORPORATION 77
Agency—The Cramer-Krasselt Co.
SPERRY GYROSCOPE CO., DIV. THE SPERRY CORP. 49
Agency—Beach, Yates, Nattoon, Inc.

THERMO ELECTRIC CO., INC. 57
Agency—Fred Lange Assoc., Inc.
THIOKOL CHEMICAL CORP. 87
Agency—John Gerber & Co., Adv.
TIMKEN ROLLER BEARING CO. 45
Agency—Batten, Barton, Durstine & Osborn, Inc.
TOMKINS-JOHNSON CO. 78
Agency—Beeson-Reichert, Inc.

VALCOR ENGINEERING CORP. 70
Agency—Adolf F. Gottesmann Adv. Agency

WARNER DIV., DETROIT HARVESTER CO. 34
Agency—Clark & Bobertz, Inc.
WELLMAN BRONZE & ALUMINUM CO. 96
Agency—R. C. Wellman, Buschman & Hines, Inc.
WESTERN GEAR WORKS 35
Agency—Ruthrauff & Ryan, Inc.
WESTINGHOUSE AIR BRAKE CO. (INDUSTRIAL PRODUCTS DIV.) 54
Agency—Batten, Barton, Durstine & Osborn, Inc.
WHITTAKER CO., LTD., WM. R. 56
Agency—Mogge-Privett, Inc.
WILCOX ELECTRIC CO. 28, 29
Agency—Carter Adv. Agency, Inc.

ZENITH AIRCRAFT CO. DIV. OF ZENITH PLASTICS ..... Second Cover
Agency—Francis D. Gonda Co.

SEARCHLIGHT SECTION

(Classified Advertising)

H. E. Hiltz, Mgr.

EMPLOYMENT
Positions Vacant 103-109
Selling Opportunities Offered 104, 108
Positions Wanted 104

SPECIAL SERVICES
To the Industry 109

PLANES—EQUIPMENT
(Used or Surplus New)
For Sale 108, 110-111

WANTED
Planes—Equipment 109

FOR *INSURED* ACCURACY
OF AIRCRAFT TEMPERATURE INDICATORS

use the **LEWIS 81T26 THERMOMETER TESTER**

A PORTABLE PRECISION MULTIPLEX INSTRUMENT

USAF TYPE N3 TO MIL-T-7449

FOR TESTING IRON-CONSTANTAN, COPPER-CONSTANTAN OR CHROMEL-ALUMEL THERMOCOUPLE INDICATORS AND ELECTRICAL RESISTANCE THERMOMETERS CALIBRATED TO THE AN-B-19 OR AN-B-31 TEMPERATURE-RESISTANCE CURVES.

FOR USE IN THE TEST LABORATORY . . . OR IN THE AIRCRAFT

the LEWIS ENGINEERING COMPANY
naugatuck, connecticut

EDITORIAL

Arming for Keeps

During the recent congressional session frequent plaints arose from minority critics in Washington that this country is "not spending enough" for defense. Unfortunately, most of these emanations carried with them a tainted odor of politics rather than the refreshing atmosphere of facts and patriotic motives.

These cries seemed to attack mainly the efforts of the Administration to wring the water out of our military program and set up a practical and efficient defense system that would give us the best Air Force, for example, for every dollar spent.

After 20 years of easy-money, conflicting policies, stop-and-go, off-and-on military programs, in a steady upward surge of the national debt that seldom reflected any desires for economies, it should appear obvious to almost any citizen that national defense also is served by maximum returns per dollar, as well as by the number of dollars spent.

Merely voting for expenditure of unprecedented billions of dollars "for defense" may ease a few Capitol Hill consciences, but it is no panacea if waste, inefficiency and faulty planning are embedded in the skyrocketing budgets.

The Eisenhower Administration's efforts to get the most Air Force for the dollar, and to introduce efficiency and businesslike philosophies, have been described in considerable detail in AVIATION WEEK in a series, "The New U. S. Air Force." This series included the complete text of a comprehensive report and appraisal of our current air policy by an Administration spokesman, Sen. Leverett Saltonstall. In contrast to such carefully thought-out policies, the inadequate complaints of the past few months, prepared more for the headlines than for public enlightenment and information, seem shallow, indeed. They were not convincing to the average citizen, who has displayed little concern over whether the current defense program might be inadequate in size.

But in recent days with publication of two powerful books, "The Hydrogen Bomb," by Shepley and Blair, and "Power and Policy," by Thomas Finletter, the atmosphere seems to reveal what may be the first faint signs of a slow, sweeping transformation in public opinion in this country. The apparent failure of Americans to realize even part of the significance of the hydrogen bomb, and of Russia's possession of it, has been a baffling phenomenon. The menace of Russia to this country simply has not been grasped in any degree by America's millions. Perhaps because it appears incredible.

Together, these two important books reveal the tremendous efforts expended on our hydrogen-bomb project. The aviation reader is compelled to reach the conclusion that a far from comparable effort has gone into building an Air Force to deliver the bombs in utmost quantity and with utmost dispatch. The atomic-powered aircraft project, to name only one special problem with too low a priority, comes to mind.

Mr. Finletter believes that the Russians will be able, in three years, to destroy the cities and industry of the United States in a single sneak blow. Instead of the current national budget of $12 billion for air, he proposes at least $18 billion for each of the next four or five years.

"Our national safety is involved as it was not with the fission bomb," he writes. "Now, in a very short time the Russians will have enough of these hydrogen bombs to create a damage of which the destruction of the U. S. might be but a small part."

Mr. Finletter places in first and indispensable priority an "air-atomic striking force, with its strategic and tactical missions combined in one command, including a greatly improved base structure, considerably better protection of the planes and bases, more and better planes to be capable of a saturation attack and much more emphasis on research and development so that we may be sure to win this race for quality—all at the level of excellence we have called overwhelming."

Mr. Finletter cites the need for sweeping changes in traditional concepts. We must combat "the drag of the past." Some of his proposals appear too drastic for imminent adoption.

However, quite credible is his belief that we shall never get the kind of force-in-being we need under the division-by-services method. "We will not have it except through a priority system rigorously applied. The reason is the dollar ceiling."

This dollar ceiling does not come through legislation or openly avowed policy, he notes. "It comes from the political inability or unwillingness, when there is not the stimulus of war or of a crisis, of any administration in power to ask for (in the case of the Executive Branch) or to enact (in the case of Congress) a level of defense appropriations which would seriously increase taxes or affect the balance of the budget. The fiscal policy of the country is controlling in deciding the top limits of defense spending except when the excitement of war or threatened war is upon us."

Mr. Finletter is no insignificant observer. His is the studied and calculated analysis of a distinguished legal mind backed by experience as a former special assistant to the Secretary of State, as the chairman of the important President's Air Policy Commission in 1947, and as a former Secretary of the Air Force. The Shepley-Blair book reveals for the first time Mr. Finletter's leading role in the shifting developments that led up to the first American H-bomb, and his incessant spurring of the project in its doubtful days. Mr. Finletter writes with convincing authority and lucidity on a terrifyingly important subject. Unlike the shrill, derisive cries of political critics, his message is that of a patriotic and gifted American.

It is on such facts and reasoning as Mr. Finletter's that the country will decide—before long, we believe—that its defense budget, now approaching an efficient basis, also must be increased in size. The signs of such public realization are becoming apparent. This realization is inevitable, barring any genuine agreement on disarmament.

—Robert H. Wood

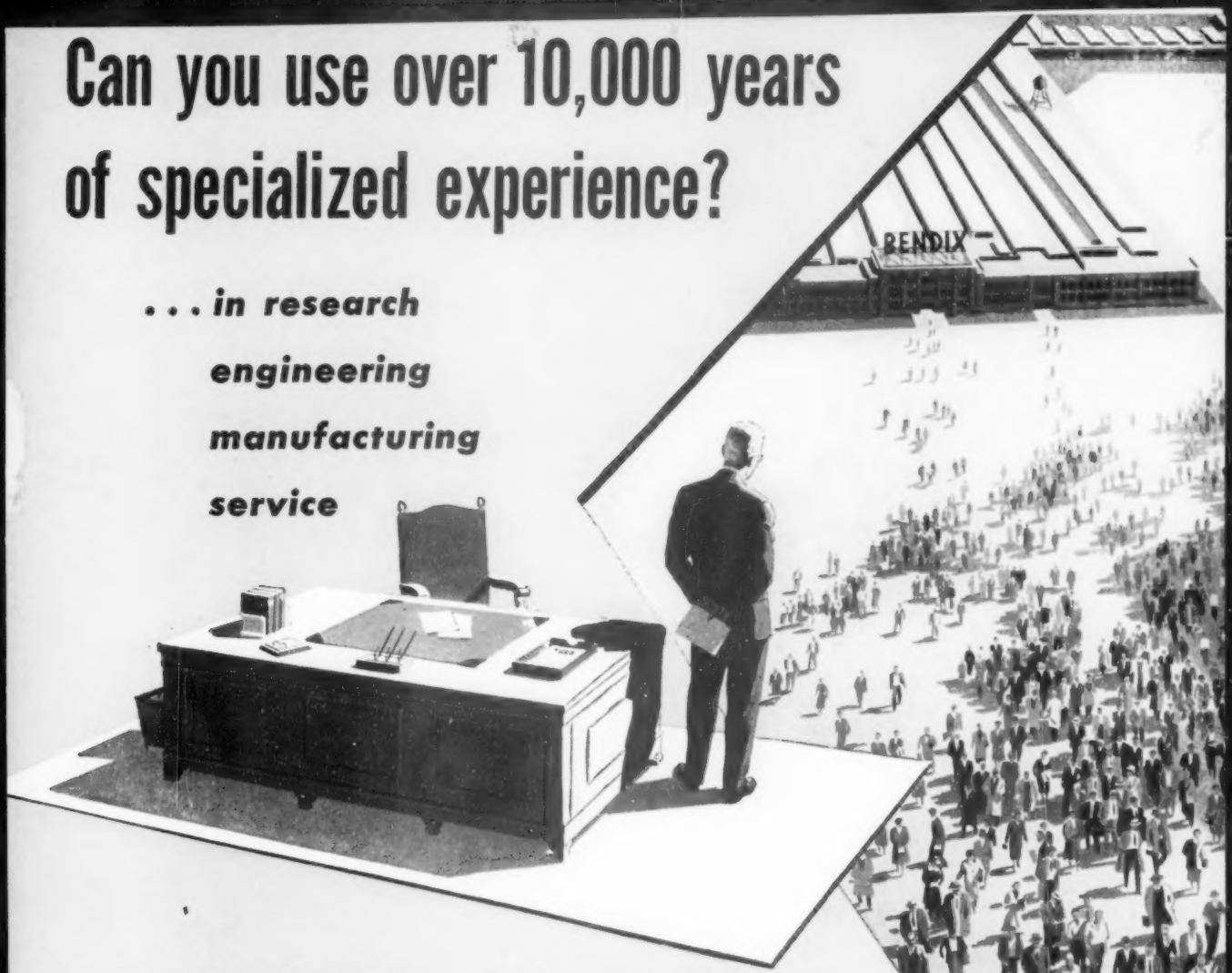
Can you use over 10,000 years of specialized experience?

. . . in research

engineering

manufacturing

service



Bendix Products, South Bend, offers the most comprehensive experience in research, engineering, manufacturing and service, on fuel metering, landing gears, wheels and brakes, to be found anywhere in the industry.

Bring your program problems to Bendix Products, and you have immediately, literally thousands of years of specialized and technical experience at your command —experience on all types of aircraft under all types of operating conditions.

Bendix Products' application of experience to your program starts with a research organization which for more than thirty years has concerned itself with anticipating tomorrow's needs.

Bendix Products engineering likewise is based on unmatched know-how rather than on trial and error methods. Bendix manufacturing facilities have constantly been and are still being expanded for more efficient operation, stepping up production, thereby lowering cost to customers.

Last but not least, an efficient, world-wide Service Organization for all Bendix products is supervised by and from Bendix Products, South Bend, to assure the full performance originally built into all products.

Why don't you put this specialized and technical experience to work on your specific planning programs, whenever fuel metering, landing gear, wheels and brakes are requirements.

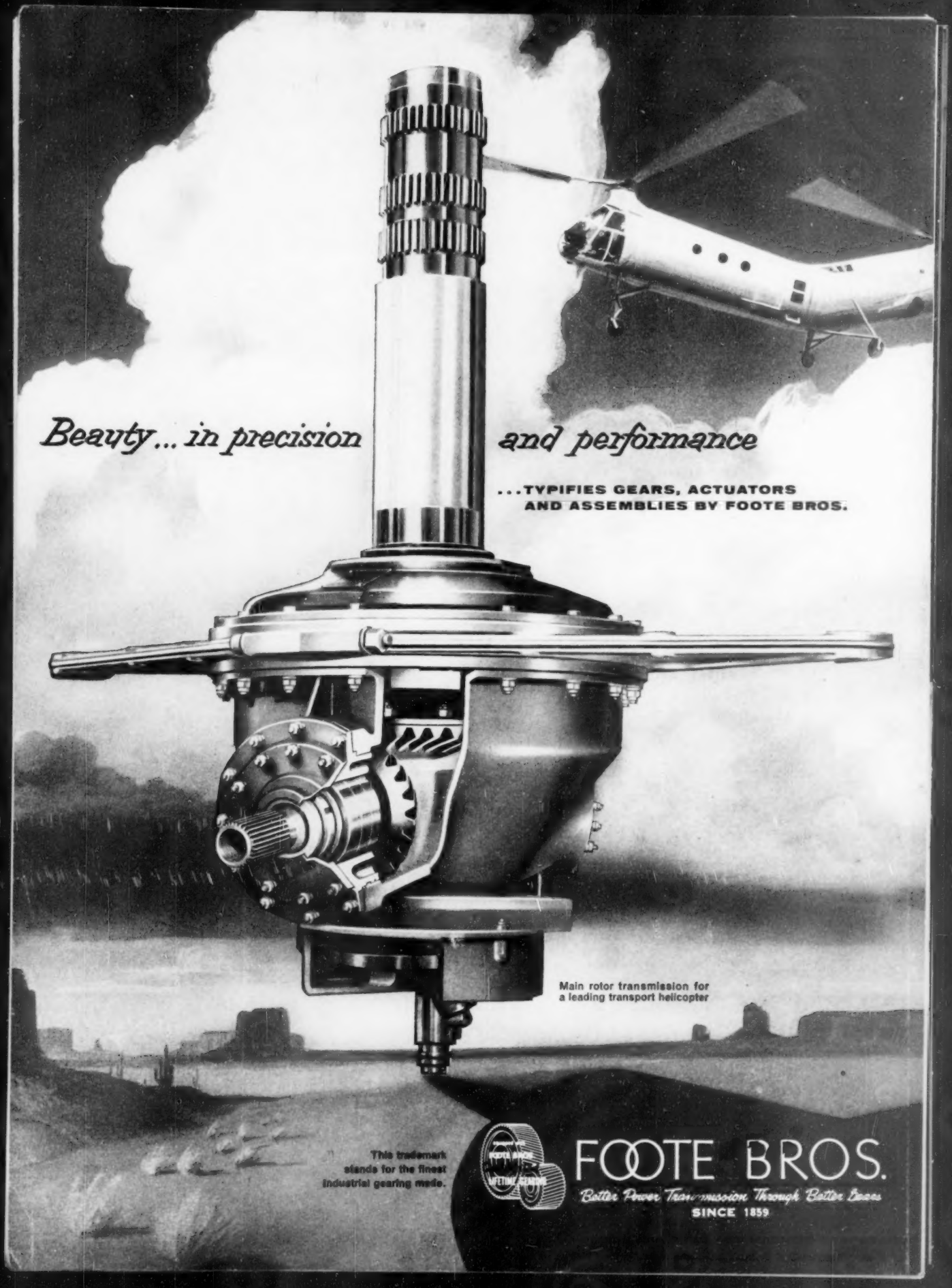
Bendix Products Division

BENDIX PRODUCTS DIVISION SOUTH BEND *Bendix* AVIATION CORPORATION

Export Sales: Bendix International Division
205 East 42nd Street, New York 17, N. Y.

Past performance is the best assurance of future achievement!

On practically every new and improved aircraft design, from the earliest models to the present DC-7, Bendix specialized experience has played an important part in setting new performance records. For example, the Bendix Direct Fuel System contributes materially to the accomplishment of faster schedules at lower operating costs in the new DC-7, the latest and greatest Douglas achievement.


Beauty... in precision
and performance
...TYPIFIES GEARS, ACTUATORS
AND ASSEMBLIES BY FOOTE BROS.
Main rotor transmission for
a leading transport helicopter
This trademark
stands for the finest
industrial gearing made.
FOOTE BROS.
Better Power Transmission Through Better Gears
SINCE 1859